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SECTION OF RADIOLOGY AND PHYSIOTHERAPY

PRESIDING: Dr. Ralph D. Leonard, Melrose, Chairman; Dr. Edward H. Trowbridge, Worcester, Secretary.

CHAIRMAN LEONARD: For the benefit of the record of the meeting, it would seem advisable that any man who wants to discuss a paper, if he will step out front and give his name, will help in keeping an accurate record of the proceedings.

The papers are theoretically limited to twenty minutes and the discussions to five minutes. The first paper, by Dr. P. F. Butler, of the City Hospital, is on "Primary Carcinoma of the Lung: Diagnosis and Treatment with the X-Ray."

PRIMARY CARCINOMA OF THE LUNG*
Diagnosis and Treatment With the X-Ray

BY P. F. BUTLER, M.D.,† AND MAX RITVO, M.D.†

INTRODUCTION

UNTIL a few years ago primary carcinoma of the lung was thought to be a very rare and unusual condition. Adler[1] in 1912 was able to compile reports of only 374 cases in the literature. During recent years, however, a very large literature has accumulated on this subject and the number of recorded cases now comprises many thousands. Statistics indicate that about five per cent of all carcinomas are of primary origin in the lung. Thus a condition which was considered very rare and of but slight clinical significance until a relatively short time ago is now known to be of frequent occurrence and a very important factor in the diseases of the lung. The increase in the number of cases reported in the literature and the apparently greater incidence of this condition are due to two factors. *First:* There has doubtless been an actual increase in the number of patients suffering from this disease. Since 1900 the average length of human life has increased about 20 years. With this greater longevity there has been, as would naturally be expected, a definite increase in cancer, arteriosclerosis and similar diseases. *Secondly:* Improved methods of study have made it possible to arrive at a better and earlier diagnosis than was formerly possible.

*Read at the Annual Meeting of the Massachusetts Medical Society before the Section of Radiology and Physiotherapy, Boston, June 9, 1932.

†Butler — Director, Radiological Laboratories, Boston City Hospital. Ritvo — Visiting Roentgenologist, Boston City Hospital. For records and addresses of authors see "This Week's Issue," page 474.

ETIOLOGY

Primary carcinoma of the lung is definitely a disease of the cancer age, as it usually occurs in patients over 40. This lesion is seldom met under 30. It is more common in males, the proportion being about four cases in men to one in women. It is generally recognized that men are more prone to pulmonary disease, and are, therefore, more apt to have carcinoma of the lung, while in females there is a much greater incidence of malignancy in the genital organs. The right lung is more commonly involved than the left. This is probably due to the fact that the right main bronchus is shorter, wider and more vertical so that foreign bodies and similar causes of irritation are more apt to cause inflammation and associated changes on the right side. While irritation appears to be an important factor in causing cancer in the lung as elsewhere, the exact method of onset of malignancy in relation to irritation is not yet fully understood. Many authors have attempted to show that the influenza epidemics have resulted in an increase in the number of cases of carcinoma of the lung. There is no proof of a relationship between influenza and cancer of the lung.

PATHOLOGY

Carcinoma of the lung appears to originate in most cases at or near the hilum. The tumor is bronchiogenic in origin, that is, it arises from the epithelium lining the bronchi. There is no proved evidence that these tumors originate

from the mucous gland cells or the epithelium of the alveolar spaces. The histologic types of cells found in these tumors vary markedly. The following types are described by Fried[2]:

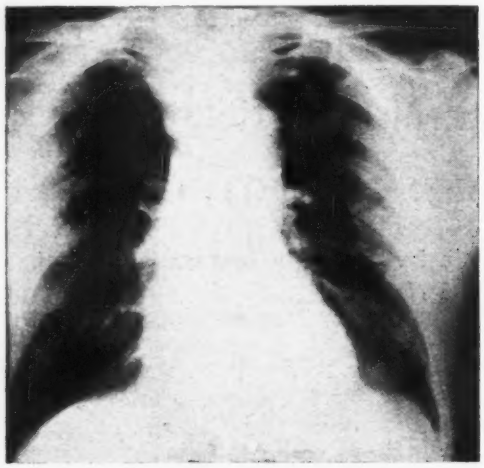

FIGURE 1.

Carcinoma of the right upper lung. There is a wedge-shaped area of density in the right infraclavicular region adjacent to the border of the sternum. The only complaint was marked hoarseness and aphonia. Patient is male, aged 59.

1. Bronchiogenic adenocarcinoma.
2. Bronchiogenic medullary carcinoma.
3. Oat cell cancer. This type forms a large mass which replaces the lymphatic glands of the mediastinum and infiltrates the pericardium.
4. Bronchiogenic basal cell carcinoma.
5. Bronchiogenic squamous cell carcinoma.

This variation in the histological picture doubtless accounts for the bizarre pictures seen

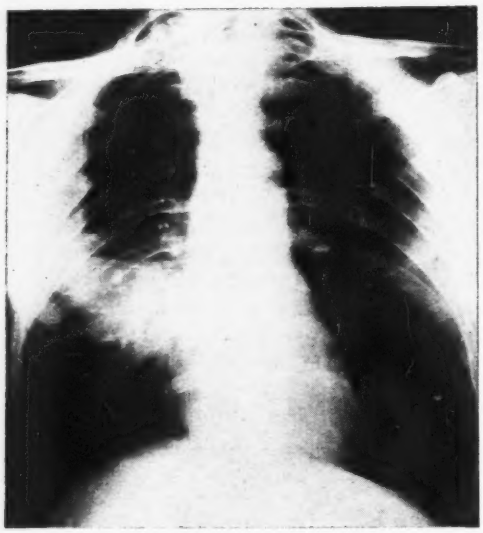

FIGURE 2.

Primary carcinoma of the lung in a male, aged 64. The mass extends across the mid-portion of the right lung field. Persistent cough and severe pain in the right side of the chest were the chief complaints.

clinically and on the roentgenogram. The tumors grow irregularly and usually involve the pleura eventually.

SYMPTOMS AND SIGNS

There are no clinical signs or symptoms which are typical or pathognomonic of carcinoma of the lung. In some cases, the clinician is able to arrive at a diagnosis by a very careful correlation of all the findings. As a rule, however, it is not possible to make a definite diagnosis with all the methods at our command. It is of the utmost importance to bear the possibility of this condition in mind in obscure pulmonary cases as more cases will be discovered early if the possibility of cancer is considered in the differential diagnosis. Carcinoma of the lung may closely simulate almost any pulmonary condition and this lesion may also occur in combination with tuberculosis, bronchitis, and many other lung diseases.

The commonest complaints of patients suffer-

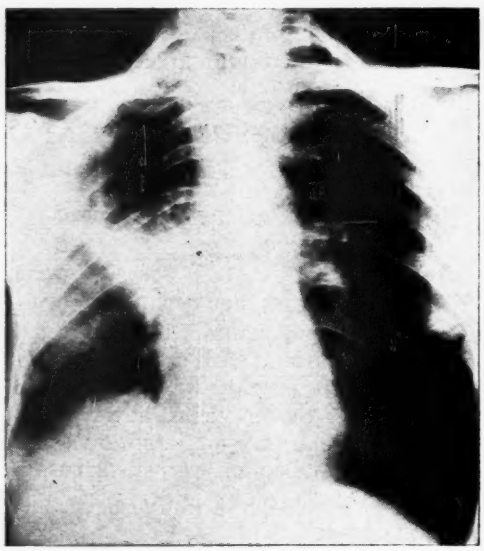

FIGURE 2A.

Same patient as in figure 3, about three months later after deep roentgen therapy. The tumor is less extensive and there was symptomatic relief. Patient is still under treatment.

ing with primary carcinoma of the lung are cough, dyspnea, pain in the chest and hoarseness. The cough is usually mild and not very troublesome; it may be very frequent and persistent. This is one of the earliest symptoms and may persist for many months, probably due to bronchial irritation. Usually it is not productive, although raising of mucopurulent, rusty or bloody sputum may occur; frank hemoptysis is rare. Dyspnea is frequently an early complaint and appears to depend on the location rather than the size of the lesion. Very small tumors which encircle or occlude the bronchus cause early and marked difficulty in respiration. Similarly, neoplasms involving the lung root, mediastinum, diaphragm or pleura may give marked dyspnea as an early manifestation. Pain in the chest may be one of the first and often is the sole complaint. The pain may be dull and inconstant or sharp and continuous. It is usually localized to one portion of the chest

and does not respond to treatment. Persistent pain in the chest in a patient of cancer age should always lead one to consider the possibility of carcinoma of the lung. Hoarseness likewise may occur early and be the only symptom for a considerable period of time. The hoarseness is usually due to pressure on or direct involvement of the recurrent laryngeal nerve. An erroneous diagnosis of aneurysm or mediastinal tumor is often due to persistent hoarseness. The above four complaints are considered the cardinal symptoms of carcinoma of the lung. They may be present singly or in any combination and should always lead the clinician to consider the possibility of this condition. Loss of weight, appetite and strength and cachexia are usually late manifestations and do not occur until the growth is very far advanced.

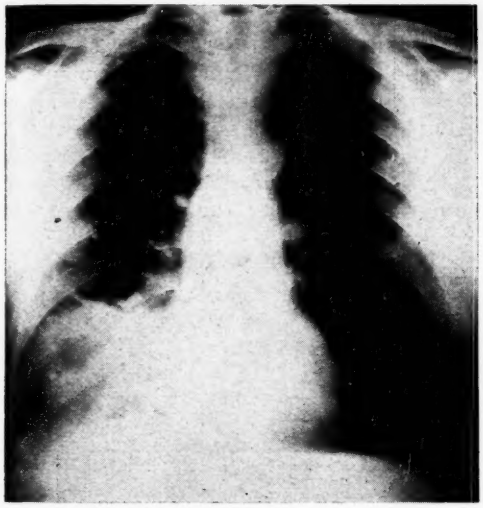

FIGURE 3.

Primary carcinoma of the right lung. The borders of the neoplasm are very irregular and there is slight retraction of the heart toward the side of the tumor. This patient developed fluid in the right chest in large amounts and metastases to the femurs and pelvic bones before death.

Fever and night sweats are likewise only rarely present. Thus it will be seen that there is no definite clinical syndrome typical of carcinoma of the lung and that while it may be possible to suspect this condition from the presence of one or more symptoms, a definite clinical diagnosis is practically impossible. It must also be stressed that there may be complete absence of symptoms till very late in the disease when the lesion is far advanced.

The physical signs of carcinoma of the lung are also very variable. In the earlier stages there may be complete absence of physical findings; as the condition progresses, the signs are present in varying degrees, depending on the size and location of the tumor. The thorax on the affected side may be contracted and show limited respiratory excursions. This may occur relatively early in the disease if the growth occludes a bronchus, causing an atelectatic collapse of the portion of the lung supplied by the bronchus. As a result of this atelectasis, the heart and mediastinal contents are displaced toward the affected side, the degree of displacement being proportionate to the amount of lung collapsed. A similar displacement of the heart and trachea occurs with pleural involvement in

FIGURE 4.

Primary carcinoma of the left lung. There is a large amount of fluid in the left chest with marked displacement of the heart to the right side. The neoplasm is overshadowed by the fluid.

which there is an obliterative pleuritis. It must be stressed that in this type of case the subsequent development of fluid may not cause the usual displacement of the heart to the opposite side and even with the formation of large amounts of fluid the retraction of the affected side of the chest persists. If fluid develops without previous atelectasis or fibrinous pleuritis, the

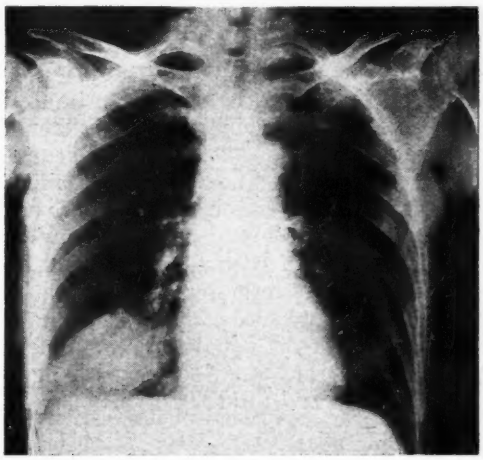

FIGURE 5.

Primary carcinoma at the base of the right lung. Note the strand-like areas of density extending toward the hilum of the right lung from the neoplasm.

physical findings are the same as with pleural effusion from any cause. Cyanosis is a rare and late manifestation. Edema may occur in the chest or arm and is due to invasion or compres-

sion of the blood vessels; this is usually associated with dilatation of the superficial veins. Enlargement of a lymph node in the supraclavicular region is occasionally found. The other superficial glands are but seldom involved. Unequal pupils are a very uncommon finding.

Fever and sweating are infrequently present and usually indicate secondary inflammatory

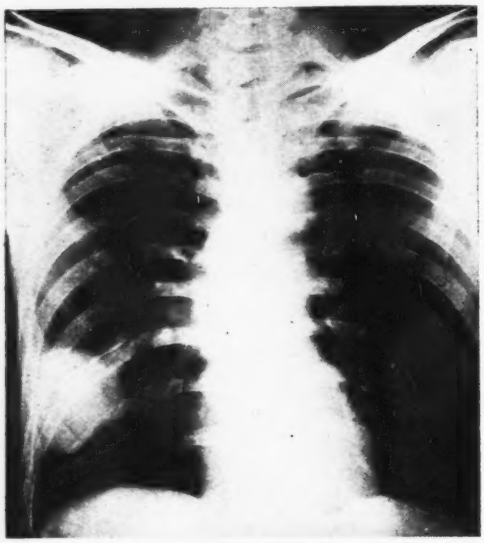

FIGURE 6.
Primary carcinoma of right lung. The mass is rounded and has smooth, sharply defined borders. There is emphysema at the right base in the region below the tumor.

changes in or about the tumor. These findings may cause confusion in the diagnosis. Hypertrophic pulmonary osteo-arthropathy with periosteal thickening of the long bones and clubbing of the fingers should lead one to consider the possibility of cancer of the lung, although it is generally recognized that these changes may be secondary to various inflammatory processes in the lung and heart conditions with passive congestion.

The signs elicited on percussion and auscultation are usually so variable in character that they cannot be depended on to arrive at a diagnosis. Frequently the mass is small and centrally located, so that the observations are entirely negative. If the tumor mass becomes very large or is in contact with the chest wall, there is dullness to flatness on percussion, alteration of the respiratory note and râles. In cases with atelectatic changes the usual signs of atelectasis are present, and the same is true with development of pleuritis and fluid.

ROENTGEN STUDY

The roentgen examination of the chest is of extreme importance in the diagnosis and study of the progress of carcinoma of the lung. The x-ray picture depends on the site, extent and stage of the lesion, as is naturally to be expected. It is the variability of these factors which accounts for the differences in the descriptions in the former reports of this condition. This also explains the great difficulty in arriving at a definite diagnosis. As a rule, it is difficult to make a diagnosis from the roentgen findings alone. However, the roentgenologist can in most cases indicate the possibility of this condition. This in conjunction with the history and other clinical findings should suffice to make the diagnosis. For convenience of description, the roentgen findings may be divided into two groups. A. Primary, which means the demonstration of the tumor itself. B. Secondary, or indirect signs. These latter include (1) pleural effusion, (2) atelectatic changes, (3) emphysema, (4) pneumonic infiltration about the tumor, (5) cavity formation, (6) bronchiectasis within and near the lesion, (7) displacement of the mediastinal structures, (8) metastases to the lungs, glands, etc., (9) erosion of the ribs.

A. Primary Roentgen Sign

The tumor itself can usually be demonstrated by the roentgen examination. The shadow cast by the tumor varies with the size, shape and location of the mass. The roentgen picture will, therefore, vary with the stage of development of the tumor at the time the studies are made.

FIGURE 6A.
Pulmonary osteo-arthropathy with elevation of the periosteum and deposition of calcium along the margins of the bones.

With the formation of fluid or other secondary changes, the lesion itself may be obscured or entirely obliterated, however, in which case a positive diagnosis is impossible or may be deduced from the secondary signs.

In the early stages the tumor is in most cases at or near the hilum or connected with the root of the lung. The mass varies in size from a cherry to as large as an orange. This area may be directly at the root of the lung, near the base

or in the upper portion of the lung field. The borders of the tumor shadow may be sharply defined or fade off gradually into the lung parenchyma. The mass is unilateral and may be in the anterior or posterior part of the chest. The shape likewise is very variable and may be rounded, oval, oblong or extend irregularly into or across the lung field. Occasionally, the tumor may be in the lung at a considerable distance from the lung root and there may or may not be thin, strand-like areas of infiltration toward or into the hilum. A rare type is that in which, instead of a single, solid tumor mass, there is a fine network of interwoven and closely connected shadows in the affected portion of the lung.

As the disease progresses, the area of density becomes progressively larger. The tumor extends into and finally entirely across the lung field. Involvement of the apex and upper lung with a uniform, markedly dense shadow is common. The tumor usually enlarges progressively and increases both in size and density. The borders of the mass may remain smooth but usually become irregular in outline. As the tumor continues to grow an entire lobe or even the whole lung may be filled with density and all the normal lung markings disappear over the involved portion of the lung. Serial roentgen studies at intervals of a few weeks are of extreme importance in the diagnosis of this condition and to demonstrate the rate of growth of the neoplasm.

It will be seen that the roentgen findings are very variable in cases of primary carcinoma of the lung. It is this very variability of the picture which is of the utmost importance in arriving at a diagnosis. Tuberculosis, pneumonia, etc., have as a rule clear-cut, well-defined roentgen characteristics. When one meets a picture which does not conform to any of the usual, well-known pulmonary conditions, carcinoma of the lung must be considered very seriously in the differential diagnosis.

B. Secondary Roentgen Signs

1. The commonest of these manifestations is pleural effusion. The development of fluid indicates involvement of the pleura by the neoplasm. The roentgen picture is the same as with fluid from any other cause. There is uniform density involving the base and lower portion of the lung field; this density obliterates the outline of the diaphragm, costophrenic angle, heart border and ribs on the affected side. The upper limit of the fluid is a curved line rising higher in the axilla than in the mid-chest. The mediastinal contents and heart are displaced to the opposite side. This typical picture of fluid may, however, be altered in one important respect. If bronchial obstruction had been present in the period before fluid developed, the atelectatic changes with displacement of the heart and trachea toward the side of the neoplasm would not be changed by the subsequent development of fluid. If tapping reveals fluid or blood with paradoxical displacement of the heart and trachea, carcinoma of the lung is the most probable diagnosis. It must be emphasized that the formation of large amounts of fluid may overshadow the tumor, so that the diagnosis of the condition underlying the fluid becomes impossible. In certain instances very massive growths may fill one side of the chest entirely and become so extensive that the heart and mediastinal contents are displaced to the opposite side by pressure from the neoplasm without there being any fluid present. Therefore, a dry tap in a case presenting the x-ray clinical signs of fluid is an important point in favor of carcinoma of the lung.

2. Atelectatic Changes

With the development of bronchial obstruction, the portion of the lung distal to the point of obstruction becomes airless, due to the absorption of the air contained therein by the circulating blood. The affected area of the lung casts a dense shadow on the roentgenogram, the diaphragm is elevated, the rib spaces become narrowed and the heart and mediastinal structures are displaced toward the affected side. This latter sign is pathognomonic of bronchial obstruction. Even relatively small tumors may bring about complete occlusion of the lumen of a bronchus by direct growth within the bronchus or by pressure from without. Bronchoscopy or the injection of iodized oil may be of great value in localizing the site and determining the cause of the obstruction in this type of case. As previously mentioned, the displacement of the heart and trachea toward the affected side may persist even after the development of fluid in the pleural space.

3. Localized areas of pneumonic infiltration or atelectasis may be present about the margins of the tumor. These areas of density may be less marked than the neoplasm itself and may obscure the borders of the tumor.

4. Emphysematous changes about the tumor shadow may occur. These shadows show increased radiance and accentuate the margins of the growth. The emphysematous areas are usually situated below or peripheral to the tumor.

5. Cavity formation within the tumor mass is an uncommon but important roentgen finding. The cavity may become quite large and show a fluid level. The massive density and infiltration about the cavity should indicate the diagnosis of carcinoma rather than abscess.

6. Bronchiectatic changes in and about the growth may occur and obscure the underlying process. Serial roentgenograms at intervals of a few weeks usually prove that the lesion is not

bronchiectasis only. Also true bronchiectasis is usually bilateral and basal.

7. Displacement of the esophagus, trachea and other mediastinal structures is common. If due to direct pressure or fluid, the displacement is to the side opposite the lesion; if due to atelectasis, there is retraction to the affected side, as already described.

8. Metastases may be to the affected lung or to the opposite side, and may be in the form of circumscribed nodules or a diffuse infiltrative density. Metastases to the supraclavicular glands, ribs and other adjacent bones may also be demonstrable. Involvement of the glands in the mediastinum may cause an increase in the angle or fixation at the bifurcation of the trachea, an important sign which is only demonstrable by roentgen study. The metastatic areas may become larger than the primary tumor.

9. Erosion of the ribs is a frequent and important finding in carcinoma of the lung. This finding may easily be overlooked if the possibility of this occurrence is not borne in mind. The presence of destruction of a portion of one or more ribs in association with an area of density in the lung or at the root of the lung is almost pathognomonic of carcinoma of the lung. Destruction of the scapula and clavicle may also occur. Actinomycosis must be ruled out in these cases.

BRONCHOSCOPY, ETC.

In addition to the clinical picture and roentgen findings, certain other studies may be of great value. These comprise bronchoscopy, the injection of iodized oil, and the laboratory investigations of the fluid obtained by tapping and of the sputum. Bronchoscopy may be of great assistance in arriving at a diagnosis in certain cases of carcinoma of the lung. This applies particularly to tumors about the hilum and those in or very near the larger bronchi in the middle and lower portions of the lung. Lesions in the apex and upper portion of the lung are not accessible to the bronchoscope. The bronchoscopic examination may show the nature of the lesion and it is occasionally possible to remove a specimen of the tumor for microscopic study by this means. Compression or obstruction of a bronchus may also be visible through the bronchoscope. The bronchoscopic examination should follow the roentgen studies and in those instances where the x-ray findings indicate that the tumor is not accessible to the bronchoscope, this method should not be used. We urge the use of the bronchoscope in properly selected cases, and feel that this method of study gives very valuable information.

The use of iodized oil is of value in certain cases. In lesions in or near the bronchi of the middle and lower portion of the lung the oil may show the point of obstruction or outline a part of the tumor. The great drawback to this method of study is that while it may show bronchial obstruction, the cause of the obstruction is not often demonstrable. The oil may be inserted through the bronchoscope or by the tracheal route, the former being more difficult of accomplishment but giving better results as a rule.

The study of the fluid obtained by chest tap is of great importance and should be carried out routinely. Bloody fluid as a rule indicates carcinoma. However, the fluid may be a serous transudate or exudate.

The study of the sputum may be helpful by ruling out tuberculosis, actinomycosis or other similar infectious processes, although the finding of a positive sputum does not necessarily exclude the possibility of carcinoma. In very rare instances the patient may cough up a fragment of malignant tissue. This tissue must be fixed and stained in the usual way and the demonstration of carcinoma in this specimen is proof of primary carcinoma, as metastatic malignancy never invades the bronchus. The excision of metastatic nodules is also recommended wherever possible.

TREATMENT

There is no satisfactory treatment for carcinoma of the lung. If the diagnosis is made early, surgery may offer hope of a complete cure by excision of the lobe involved by the neoplasm. Deep roentgen therapy appears to retard the rate of growth of these tumors and prolong life. X-ray treatment is also often of great importance in relieving the pain, dyspnea and cough associated with these neoplasms. Radium is of value. If the tumor is accessible to the bronchoscope, radium seeds may be implanted into the mass. External radiation with radium is not practical at the present time, few clinics having the large quantities of radium required for this mode of treatment. Both roentgen and radium rays are palliative, not curative; however, we feel that radiation is of considerable value in prolonging life and giving greater comfort to the patient and strongly urge the use of these measures in every case of malignant disease of the lung. The use of opiates is usually necessary for relief of pain and should be resorted to when other measures have failed. The usual supportive measures, including iron, arsenic, and similar methods as in other types of carcinoma must also be used.

SUMMARY

Primary carcinoma of the lung is a relatively common condition and not the rare unusual lesion previously supposed. It is a disease of the cancer age, is more common in men, and involves the right lung more frequently than the

left. These tumors are bronchiogenic in origin, originating from the epithelium lining the bronchi.

The common clinical symptoms are cough, dyspnea, pain in the chest and hoarseness. The physical findings are very valuable and depend on the size and location of the tumor. If the mass is small or deep in the lung, there may be complete absence of signs and symptoms. Atelectatic changes due to bronchial occlusion and the formation of fluid in the pleural space are common.

The roentgen examination is of extreme importance, both in arriving at a diagnosis and in studying the progress of the disease. The roentgen signs are divided into primary and secondary manifestations. The primary x-ray sign is the demonstration of the tumor and it is possible to show the size, shape and location of the mass. The secondary manifestations comprise pleural effusion, atelectatic changes, emphysema, pneumonic infiltration, bronchiectasis, displacement of the mediastinum, metastases and erosion of the ribs.

Bronchoscopy, the injection of iodized oil and laboratory investigations of the sputum and the fluid obtained by tapping the chest are of great value in arriving at a diagnosis. In the treatment of this disease, surgery may offer hope of cure if the diagnosis is made early. Roentgen and radium therapy prolong life and give relief of distressing symptoms.

REFERENCES

1 Adler, I.: Primary Malignant Growths of the Lungs and Bronchi. New York, Longmans, Green, and Co., 1912.
2 Fried, B. M.: Primary carcinoma of the lung. Medicine. 10:373 (Dec.) 1931. Williams and Wilkins Co., Baltimore, Md.

Discussion

Chairman Leonard: We are very fortunate in having Dr. D. Campbell Smyth, of Brookline, to open the discussion of this paper.

Dr. D. Campbell Smyth: *Mr. Chairman and Gentlemen* — I enjoyed Dr. Butler's paper very much. I had no definite idea what he was going to talk about as I was asked only last night to discuss his paper, so I have that excuse for a rather poor discussion. I agree with him in most of the things he has stated but in a few minor points I will probably disagree. Again, I can only discuss this paper from, perhaps you might say, the narrow bronchoscopic standpoint. I consider that obscure pulmonary cases should be studied the way they are at the Massachusetts General Hospital, i.e., through a thoracic clinic.

Pulmonary work has become a highly specialized part of internal medicine, and the group that studies cases of this kind consists of what I might call a pulmonary internist, thoracic surgeon, roentgenologist, and bronchoscopist, so that the different points involved can be taken up and discussed by the group.

The x-ray will not show early carcinoma of the lung, and it will not definitely diagnose the advanced cases, except the roentgenologist may be able to show a lesion strongly suggestive of carcinoma. Unless there is decided pulmonary involvement, it may not show it at all, and certainly, the small nodules on the bronchus wall are not shown by x-ray. They can be diagnosed only by bronchoscopy.

Dr. Butler spoke of atelectasis as an early sign. It is an early sign, as we see it, but it should not be so early a sign. More attention should be paid to obstructive emphysema. One of the first signs of the x-ray picture is the inequality of the air getting into the diseased lung. There is a more contracted lung field on full inspiration. That is due to a bronchiogenic lesion partly obstructing the bronchus. A little later we will get a definite obstructive emphysema due to the air trapping in the lung.

Physiologically, the bronchus dilates on inspiration. Now, if the x-ray picture shows some difficulty in the entrance of air within the lung, it is having more difficulty getting out because on expiration the bronchus contracts, and a tumor that partly closes the bronchus on inspiration closes it more on expiration.

The point I am bringing out is this: When we get atelectasis of the lobe of a lung, earlier observation of that same case must have shown obstructive emphysema because obstructive emphysema must come before atelectasis, that is, air must have had difficulty for some weeks or months getting into that lobe. So that we feel that full inspiration and full expiration plates should always be taken in suspicious cases to show air-trapping in a whole lung or even air-trapping in a small part of the lobe of a lung if the lesion happens to be in one of the small bronchi. So, air-trapping is a very important sign indicating not only the presence of foreign bodies but either a benign or malignant tumor in a bronchus.

As Dr. Butler stated, the early symptoms are vague. They are symptoms of a bronchial irritation. A cough is sometimes present without much if any sputum. Daily pain in the chest is present in a large number of cases. Bronchoscopy in those cases—and, of course, bronchoscopy should be done in all obscure lung conditions that cannot be definitely diagnosed clinically—will do three things. First of all, if it is bronchiogenic carcinoma in the main bronchus, we can get a specimen for biopsy and make a definite diagnosis; secondly, we can take measurements giving the thoracic surgeon an idea whether the case is operable; and thirdly, we can outline the tumor's extent very definitely by filling the normal lung around the lesion with lipiodol. So that bronchoscopy is the only way to make a definite diagnosis of tumors when

they are bronchiogenic. Probably most of them are bronchiogenic but a great many of them do not show in the main or secondary bronchi. They may, however, be bronchiogenic in some of the smaller bronchi.

Another thing to remember which Dr. Butler mentioned is the not infrequent occurrence of lung abscess in connection with malignancy. Either the center of the carcinoma breaks down in a certain number of the cases and the diagnosis of lung abscess is made, or the small bronchi below are shut off by a large growth causing a bronchiectatic condition, some of them resulting in a lung abscess distal to the tumor.

Three weeks ago, at Atlantic City, before the American Bronchoscopy Society, I had the pleasure of listening to and discussing a paper by Dr. Vincent, of the Mayo Clinic. His figures run very close to ours. I might say that at the Massachusetts General Hospital in 1912 there was one case diagnosed as carcinoma of the lung. In 1928, there were 12; in 1929, there were 15; in 1930, there were 16; and in 1931, 16; that is, we have had over 60 cases in the last four years. Whether carcinoma in this location is becoming more frequent or the diagnosis has been made more carefully, I do not know, but it seems to be on the increase.

Dr. Vincent reported 71 cases of bronchiogenic carcinoma in the last five years at the Mayo Clinic. Of those cases, he treated 41 with deep x-ray. His results at least would surprise one. He treated 41 of them and 11 are living, some of them over three years, and the last case started about several months ago.

It is not quite fair to report the results of deep x-ray treatment of carcinoma of the lung without stating just what the tumor is. To state simply it is carcinoma and not differentiate the types, whether one is of the radiosensitive types, is one thing; and also there is the fact that most of those tumors of the lung are very slow growing, and patients often live a long time. I followed one case almost five years after biopsy diagnosis was made, and one three and a half years; so that it is difficult to draw conclusions.

Also, the x-ray plates of these patients show what appears to be a very definite improvement where oftentimes there is not a great deal. It is true the growths have shrunk but this releases secretions and helps clear up the secondary involvement present in nearly all cases. I noted in Dr. Butler's plates that a lot of his tumors were lower lobe tumors, and I want to say a word about that.

Last year, Dr. Churchill operated on two cases of carcinoma of the lung that I know of. It is astounding that about ten years ago the mortality for lobectomy was nearly 100 per cent. Today, in favorable operative cases it is down to nearly 10 per cent, and in unfavorable operative cases, it is no higher than 25 per cent.

Now, then, given a tumor in the lower lobe of the lung, it seems to me that today it comes into the operative field, judging from Dr. Churchill's results. True, he lost one case about a week after operation from pneumonia, but since then he has operated on a young woman who was admitted to the hospital on account of hemoptysis from a supposed tuberculous infection. In this case bronchoscopy showed a nodular mass just below the bifurcation of the bronchus in the region of the middle and lower lobes of the lung. In order to operate on the patient it was necessary to take out the middle and the lower lobes. This was successfully done, and I will show you slides of the case. I have only four slides so I will not keep you long. The cases of the upper lobe are absolutely hopeless for operation, as are also those with the lesion around the bifurcation of the trachea.

I think if we are ever going to get anywhere in the treatment of carcinoma of the lung, it will be by a group study of the cases and getting them early, and that consists of getting the internist, the roentgenologist, and the bronchoscopist together to make an early diagnosis.

(Discussion of slides.)

CHAIRMAN LEONARD: We have a wealth of material, and we are limited as to time, and I am therefore afraid we will have to proceed promptly with the next paper. I do not believe there is very much opportunity for general discussion of this excellent presentation, unless somebody has some particular point to bring up. I will just ask Dr. Butler if he has any word to say in conclusion.

DR. BUTLER: There is not much further to add. There was a paragraph in the paper on the value of bronchoscopic examination but it was omitted to save time and also because I knew Doctor Smyth was going to talk about it. There is no doubt as to the value of bronchoscopy as an aid in diagnosis. Certain contraindications to operation are brought out by the roentgen examination, which were not mentioned in the paper; involvement of the hilus glands, involvement of the pneumogastric nerve and localization of the tumor in the upper lobe.

CHAIRMAN LEONARD: The next paper in our program is "Roentgenologic Diagnosis of Gall-Bladder Disease," by Dr. George Levene, of Norwood.

DR. GEORGE LEVENE: *Mr. Chairman and Gentlemen* — X-ray examination of the gall-bladder by means of the Graham test has done more than merely increase the frequency with which the pathologic gall-bladder may be detected. It has given us more intimate knowledge of the physiology of the gall-bladder, as a result of which early functional disturbances may be detected.

The gall-bladder is a hollow viscus having a mucous, serous and muscular coat. It fills and empties through its cystic duct. Its functions as we know them are to store bile in the intervals of digestion and to discharge this bile when occasion demands.

The scope of our examination must necessarily include a consideration of the anatomical and functional characteristics of the gall-bladder.

It is generally believed that good visibility on the film, that is, a dense shadow which contracts after fat is given, indicates a normal gall-bladder. We believe that such evidence is inadequate. After a satisfactory film is obtained we give the patient a motor meal consisting of four egg yolks and half a pint of heavy cream mixed with ginger ale or other vehicle to make a palatable beverage, and to this we not infrequently add barium sulphate so that we can study the gall-bladder in company with the stomach and duodenum. About 10 or 15 minutes after the motor meal has been given the patient is examined under the fluoroscope.

ROENTGENOLOGIC DIAGNOSIS OF GALL-BLADDER DISEASE*

BY GEORGE LEVENE, M.D.†

CHOLECYSTOGRAPHY was introduced as a test of gall-bladder function[1]. It was a great stride from the day when roentgenologic examination of the gall-bladder was limited to the demonstration of the occasional calcium stone and thickened vesicle, or the somewhat hazardous interpretation of secondary evidence suggestive of gall-bladder disease, to the day which marks the advent of cholecystography.

FIG. 1. The convoluted portion of the cystic duct is an important mechanism when stones are present.

Continued application of the Graham test has proved that it is more than a test of gall-bladder function. For, if we concede that the function of the gall-bladder is to store and concentrate bile in the intervals of digestion and to discharge this bile when occasion demands, we must also agree that these manifestations of normal function may be elicited even in the presence of definite histological aberrations. Such gall-bladders cannot, obviously, be called normal, but are readily identified by careful cholecystographic examination.

The gall-bladder has mucous, muscular and serous coats, and receives and discharges bile through the cystic duct. The mucous membrane is redundant, particularly in the cystic duct, where it is disposed in free, spiral folds (Heister's valve) (Fig. 1). The muscular tunic consists of strands of muscle fibres irregularly distributed, whose contraction, nevertheless, must inevitably reduce the size of the gall-bladder. The serous or peritoneal coat is loosely adherent and completely envelops the vesicle, except on its superior surface, where it is separated from the liver by areolar tissue.

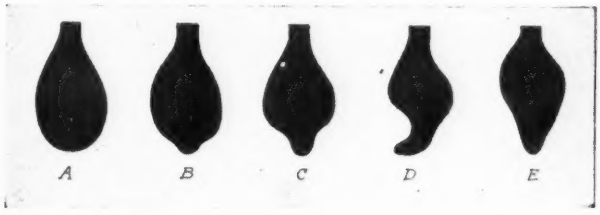

FIG. 2. Gall-bladder contraction as seen under the fluoroscope after the ingestion of motor (fat) meal.
A. Gall-bladder at rest.
B. and C. Usual types of contraction.
D. Unequal contraction of longitudinal bundles.
E. Vigorous contraction, frequently seen in gall-bladders containing stones.

Concentration of bile is accomplished through the activity of the mucosa. Emptying of the vesicle is produced by the activity of the muscularis. Gall-bladder contractions of divers varieties are encountered, the type most frequently seen consisting of slight, localized alterations of contour along the borders of the vesicle, most marked at the fundus (Fig. 2). These contractions appear to be cyclic and are accompanied by a tonic contraction of all the muscle fibres, which progressively increases until the vesicle has attained its smallest possible size.

The claim of several competent observers[2, 3] that they have failed to see gall-bladder contractions under the fluoroscope, has led us to restudy this problem with renewed interest—as a result of which, it is our opinion that these ob-

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servers must have seen gall-bladder contractions, but failed to identify them as such. Gall-bladder contractions are comparatively faint, and unlike gastric peristalsis.

It is necessary to take cognizance of the anatomical and physiological characteristics of the gall-bladder in order properly to evaluate the

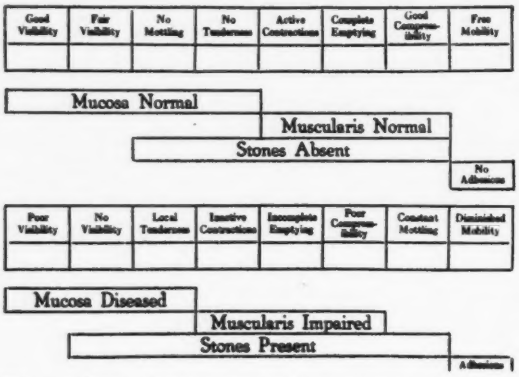


FIG. 3. Chart showing observations necessary for complete gall-bladder study and their significance.

observations in a cholecystographic examination and to this end, the use of the fluoroscope is as helpful as it is in the study of the gastro-intestinal tract. In the examination of the stomach, a diagnosis is not based upon the determination of a single factor; so in the examination of the gall-bladder complete diagnosis depends upon observations relative to visibility, mottling, tenderness, contractions, elasticity, mobility and emptying (Fig. 3).

ACUTE CHOLECYSTITIS

This type is least frequently seen by the roentgenologist. The clinical picture is usually well enough defined to obviate the necessity for cholecystography. The gall-bladder is not visualized (or its shadow is very faint). Fluoroscopic localization of tenderness is not possible in the absence of a shadow but most of these patients exhibit reflex tenderness[4], elicited in the right costovertebral angle.

CHRONIC CHOLECYSTITIS

An attempt to evaluate the extent of the disease by the density of the shadow, alone, is apt to be misleading. Recalling that the pathologic changes of chronic cholecystitis are not limited to the mucosa, but involve the other structures as well, it is apparent that diagnosis depends upon the determination of the integrity of these structures. Visibility is therefore but one sign. Under fluoroscopic control, the gall-bladder is usually found to be tender and over ninety per cent of these patients have reflex tenderness.

Adhesions result in either diminished or absent mobility of the vesicle, depending upon whether it is fixed to a movable viscus (as the duodenum) or to its fossa in the liver.

Active contractions are weak or absent and reflect the extent of the disease. Thus emptying is delayed, a fifty per cent residue at five or six hours being not infrequent.

Elasticity of the vesicle is determined by manual exploration under the fluoroscope. This observation is made in the following manner. The index finger of each hand is pressed firmly against the abdominal wall at either side of the fundus of the gall-bladder. Maintaining this pressure, the patient is instructed to take a deep breath, during which the vesicle will be seen to glide between the fingers as an elongated and narrow shadow (Fig. 4, A and B). This observation is continued during expiration.

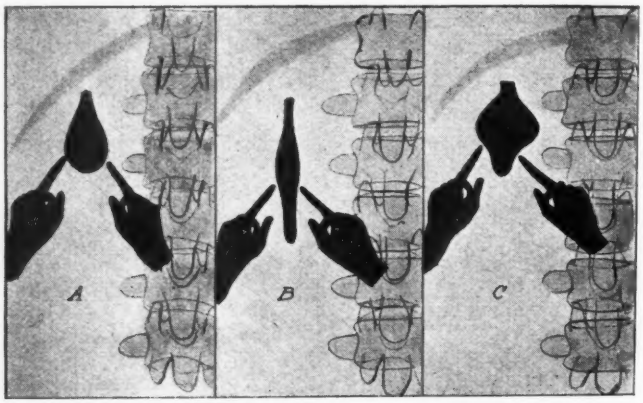


FIG. 4. Fluoroscopic determination of elasticity ("Stripping"):
A. Index fingers placed on abdominal wall at either side of fundus.
B. During deep inspiration, a normal gall-bladder glides between fingers as an elongated and narrow shadow. If the gall-bladder is fibrosed and thickened, this change is not observed.
C. When stones are present, a definite "bulge" appears at the finger tips.

In the presence of degenerative changes of the muscular tunic, elasticity as determined under the fluoroscope ("stripping") is definitely impaired.

The classical findings which constitute the basis for diagnosis of chronic cholecystitis may therefore be summarized as follows: poor visi-

bility, direct and reflex tenderness, diminished mobility (as a rule), weak contractions, diminished elasticity and delayed emptying (Fig. 5).

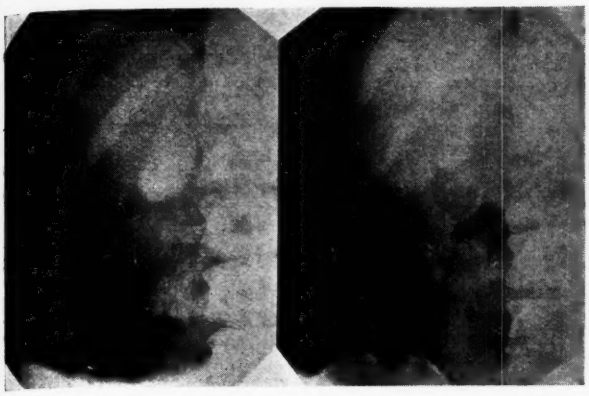


FIG. 5. Good visibility in a case of chronic cholecystitis, with delayed emptying due to involutionary changes of the vesicle.

STONES

Calcium stones almost always indicate more extensive disease of the gall-bladder than do cholesterol stones. This may perhaps be explained by the greater period of time necessary for the formation of calcium stones. Thus, visibility on the cholecystogram depends upon the type of stone, and, also, upon the amount of chronic inflammatory damage to the vesicle (Fig. 6).

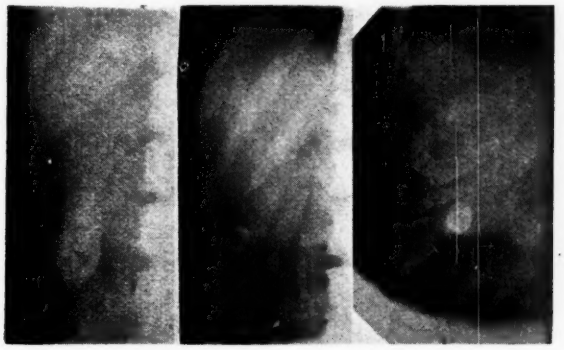


FIG. 6. A. Good visibility of gall-bladder containing cholesterol stones.
B. Poor visibility of gall-bladder containing cholesterol-calcium stone.
C. No visibility of gall-bladder containing calcium stone.

Occasionally, a stone lodged in the cystic duct may so effectually occlude the neck of the vesicle as to prevent filling of the gall-bladder (Fig. 7).

The occlusion of the cystic duct by a stone is much less apt to occur during filling than during emptying of the vesicle. This is explained by the fact that the gall-bladder is relaxed during filling, while it is in a state of increased tonus during emptying.

It is generally known that gall-bladders containing stones may produce no direct (sub-costal) tenderness. A vast majority of these cases, however, show reflex tenderness in the right costovertebral angle.

Mobility depends upon the amount, if any, of perivesicular inflammation.

"Stripping" usually affords suggestive, if not definite evidence of the presence of stones. The

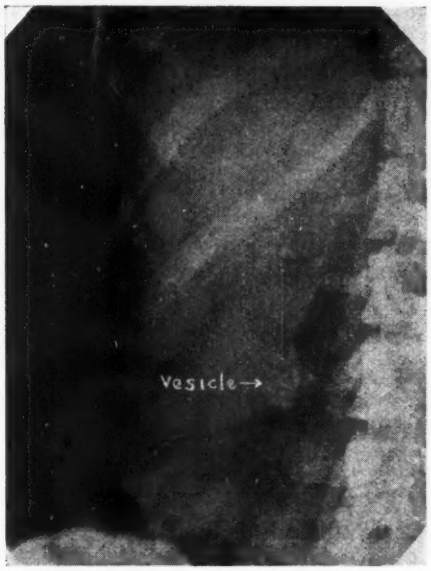


FIG. 7. Poor filling due to occlusion of the cystic duct by small cholesterol stone (arrow).

vesicle does not slip through the fingers as an elongated and narrow shadow, but presents a "bulge" at the finger-tips, corresponding to the site of the incarcerated stones (Fig. 4 C).

Active contractions are generally observed, except in cases of stones associated with advanced pathology of the vesicle. It is interesting to note that in gall-bladders containing stones, but which are otherwise not severely damaged, contractions are stronger than in the normal vesicle. This observation becomes of diagnostic importance in the case of a well-visualized gall-bladder which fails to empty. If active contractions are observed, the presence of stone must be definitely suspected as a cause of retarded emptying (Fig. 8).

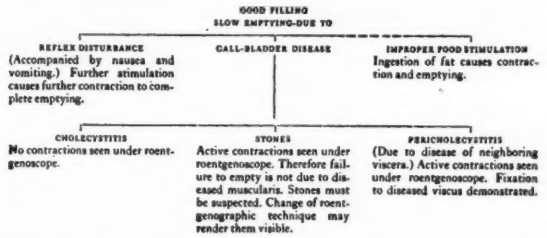

GOOD FILLING
SLOW EMPTYING-DUE TO
REFLEX DISTURBANCE
(Accompanied by nausea and vomiting.) Further stimulation causes further contraction to complete emptying.
GALL-BLADDER DISEASE
IMPROPER FOOD STIMULATION
Ingestion of fat causes contraction and emptying.
CHOLECYSTITIS
No contractions seen under roentgenoscope.
STONES
Active contractions seen under roentgenoscope. Therefore failure to empty is not due to diseased muscularis. Stones must be suspected. Change of roentgenographic technique may render them visible.
PERICHOLECYSTITIS
(Due to disease of neighboring viscera.) Active contractions seen under roentgenoscope. Fixation to diseased viscus demonstrated.

FIG. 8. Chart showing differentiation of the causes of slow emptying of the gall-bladder.

Gall-bladders containing stones have given us the most striking proof that the vesicle contracts and empties by the activity of its own musculature. So frequently have we observed under the fluoroscope and on the film definite activity of the vesicle, together with mass-shifting of stones (Figs. 9 and 10), and distortions

of contour suggesting irregular contraction or spasm, that we entertain very little doubt regarding the mechanism of emptying of the gall-bladder. The hypothesis advanced by some observers[2] that the gall-bladder empties its bile, not by the activity of its own musculature, but

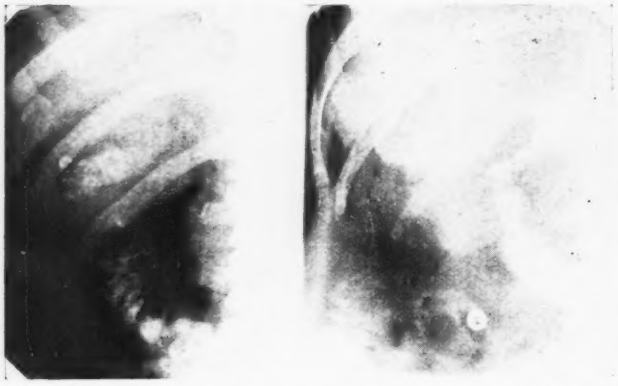


FIG. 9. A. Large group of stones with gall-bladder relaxed.
B. One-half hour after motor-meal. Note how stones have been forced into a spherical group by activity of the gall-bladder.

rather as a result of a negative pressure induced by passage of bile through the common duct, which seemingly aspirates the bile; or, that it is expelled by an elastic recoil of the vesicle when the common duct is open, does not

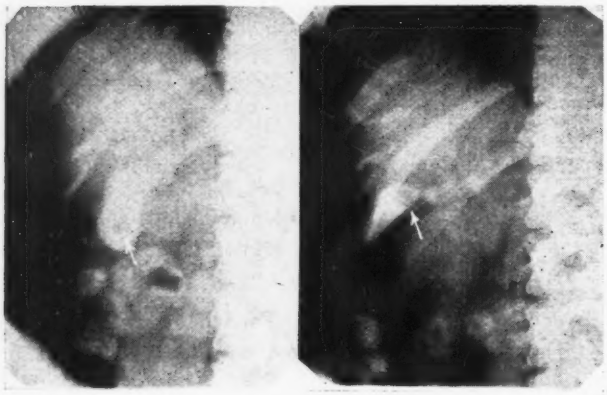


FIG. 10. A. Gall-bladder at rest; stone at fundus.
B. Fifteen minutes after motor-meal, showing marked tapering of fundus due to active contraction which has forced stone into neck of vesicle.

impress us as a tenable hypothesis consistent with clinical observations. We cannot conceive that this mechanism could be sufficiently strong to aspirate a stone from the fundus of the vesicle into the common duct and produce gall-stone colic.

If negative shadows are produced by stones, they must repeatedly be seen within the shadow of the gall-bladder.

Since the cystic duct is fixed, the fundus rises as the vesicle contracts. Mottling due to stones will therefore move with the shadow of the gall-bladder; whereas mottling due to gas in the colon or duodenum will change its position relative to the gall-bladder (Fig. 11).

ADHESIONS AND ABNORMAL PERITONEAL ATTACHMENTS

Perivesicular adhesions are either associated with disease of the gall-bladder itself, or with disease of the neighboring viscera. When the vesicle is adherent to the under surface of the liver, mobility, as determined under the fluoro-

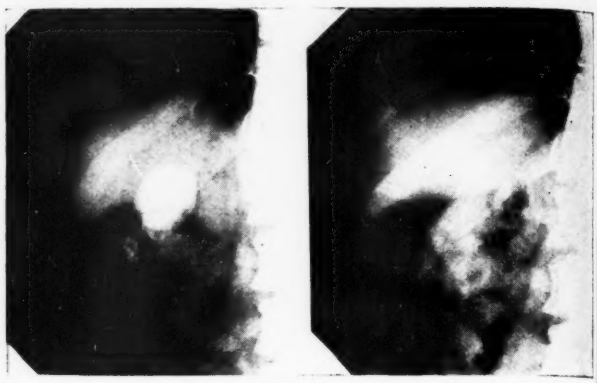


FIG. 11. A. Gall-bladder with two negative shadows simulating stones.
B. Gall-bladder draws up as it contracts, leaving behind shadows not due to stones.

scope, is absent. When adherent to the duodenum or hepatic flexure, the vesicle shows a certain range of mobility; the adherent viscus, however, moves with it. The most definite evidence of this type of adhesion may be derived from the combined fluoroscopy of the gall-bladder and duodenum (Figs. 12 and 13).

FIG. 12. Adhesions between gall-bladder and duodenum demonstrated by combined examination.

Emptying of the gall-bladder is frequently delayed. During the process of emptying, we have observed, in a few instances, a change in the angle of the hepatic flexure suggestive of adhesions. As the gall-bladder emptied, the angle of the hepatic flexure became more acute (Fig. 14).

Abnormal peritoneal attachments between the

gall-bladder and duodenum show either as a puckering of the fundus, an angulation of the vesicle, in which the lower half or third lies almost horizontally, or in a general obliquity of the entire gall-bladder, the fundus pointing downward and toward the spine (Fig. 15).

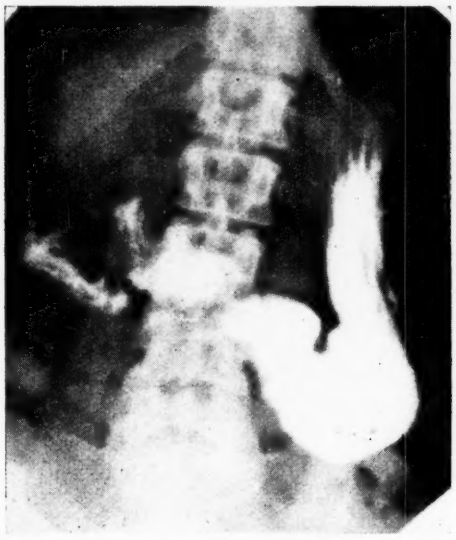


FIG. 13. Typical distribution of duodenum when adherent to gall-bladder.

By combined fluoroscopy[5], it is found that the gall-bladder and duodenum are not readily separable.

The differentiation of inflammatory adhesions and abnormal peritoneal attachments is difficult to make. Good visibility favors the latter condition, whereas roentgenologic findings of cholecystitis suggest that the adhesions are inflammatory.

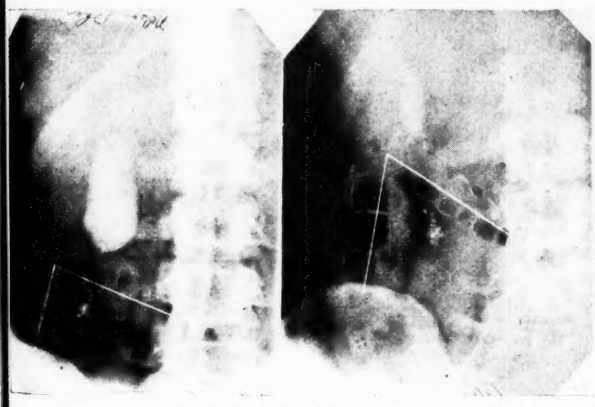


FIG. 14. Perivesicular adhesions. The angle of the hepatic flexure becomes more acute as the gall-bladder contracts.

FUNCTIONAL AND MECHANICAL INFLUENCES

Not infrequently during the course of contraction of the gall-bladder following the motor-meal, the vesicle is found to increase suddenly in size. Associated with this increase is nausea and vomiting. We have described this syndrome as typical of reflex disturbance[6]. The increase in size may be due to a relaxation of tonus of the muscle fibres of the vesicle, together with an influx of liver bile which is shunted to the cystic duct in consequence of spasm at the pylorus and common-duct sphincter.

When the nausea has subsided, it has been our practice to administer another motor meal. Such further stimulation usually results in resumed contraction and emptying (Fig. 16).

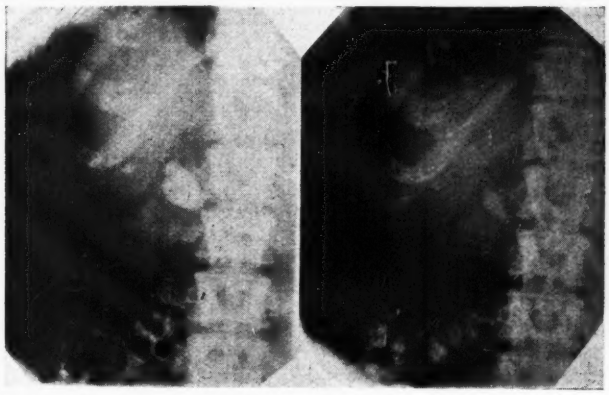
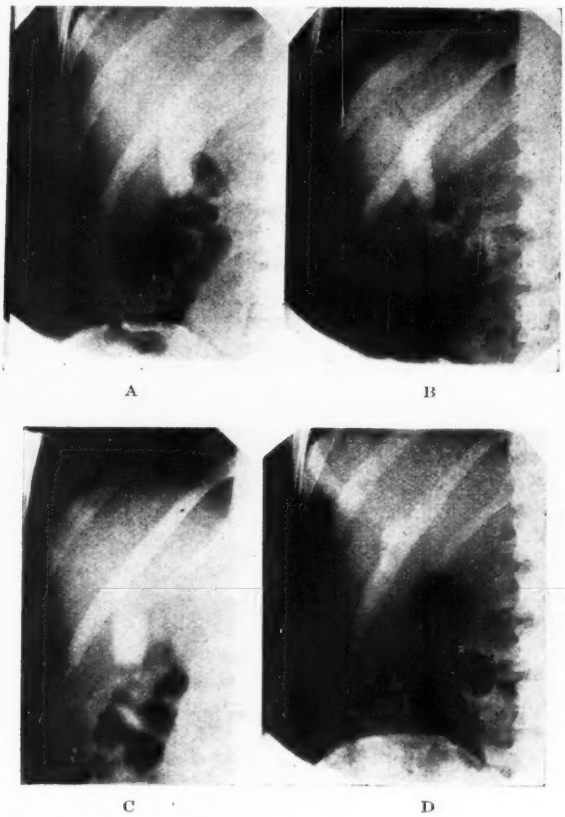


FIG. 15. Typical appearance of gall-bladder when adherent to duodenum by abnormal peritoneal attachment.

Anatomical variations in the position of the gall-bladder, often associated with abnormal

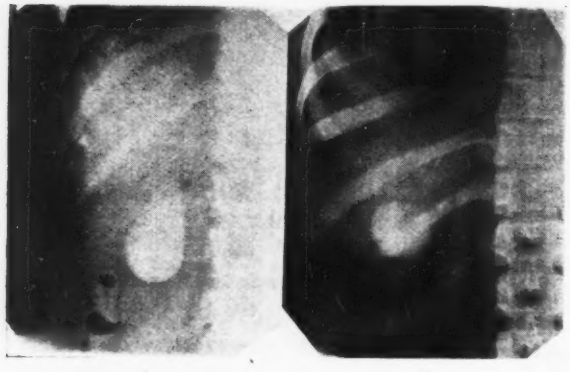


A B C D

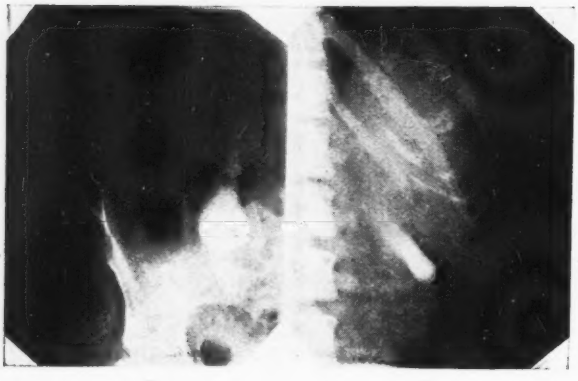
FIG. 16. Reflex syndrome:
A. Gall-bladder at rest.
B. Contraction one-half hour after motor meal.
C. Sudden relaxation and increase of size (accompanied by nausea and vomiting).
D. Contraction resumed after ingestion of another motor meal.

peritoneal attachments, and in which the cystic and common ducts do not share, result in peculiar distortions and angulations of the ducts which are of more than academic interest. They are at least a source of potential biliary stasis.

FIG. 17. Malposition of gall-bladder with "figure of eight" loop of cystic duct.



A B



C D

FIG. 18. A. Usual position of gall-bladder, below twelfth right rib.
B. High gall-bladder, overlying eleventh rib.
C. Gall-bladder well below iliac crest.
D. Gall-bladder on patient's left side.
"C" and "D" may readily be overlooked.

Not uncommonly, the gall-bladder may be found on the lesser curvature side of the duodenum. As a result, the cystic duct forms a complete loop on its way to the common duct (Fig. 17).

The variable location of the gall-bladder has frequently been described; yet the diagnosis of cholecystitis based on non-visualization of the gall-bladder on the film, suggests the necessity for emphasizing the fact that the gall-bladder

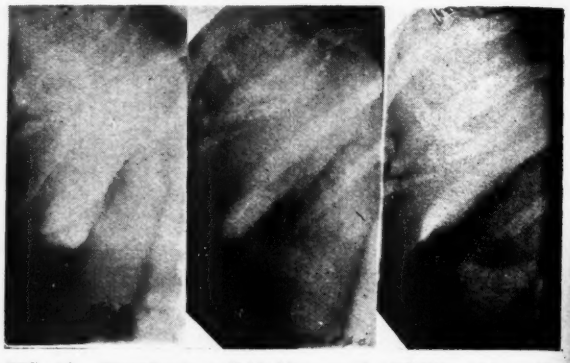


FIG. 19. Strawberry gall-bladder: good visibility and rapid emptying are diagnostic signs.

FIG. 20. Strawberry gall-bladder containing one cholesterol stone, showing good visibility and rapid emptying (one and three-quarter hours).

may lie high up under the costal arch, in the pelvis, overlie the spine, or be on the left side (Fig. 18). Fluoroscopy is an added measure of assurance in the examination of such patients.

THE STRAWBERRY GALL-BLADDER

The usual diagnostic criteria of the Graham test fail to recognize the strawberry gall-bladder, for in this case good visibility and complete emptying are always obtained.

We have observed, however, that cholesterosis of the mucosa presents definite roentgenologic evidences by which it may be identified. The shadow obtained on the cholecystogram is invariably dense. In a recent article Rossi[7] describes the appearance of the strawberry gall-bladder as a "faint shadow". Regarding the density of the shadow, we cannot concur with

Rossi's conception. It seems quite probable that the cases he had examined were of comparatively long standing, and had progressed beyond the stage of simple cholesterosis.

Most of our patients exhibited reflex tenderness; and many showed direct tenderness under the fluoroscope.

Adhesions were conspicuously absent, unless there was associated disease (as ulcer).

Cholesterol stones are often present. Stimulation by the motor meal elicits active contractions; the strawberry gall-bladder with a few, small, cholesterol stones being the most active of all. Emptying is therefore very rapid, complete disappearance of dye occurring in from thirty minutes to two hours (Figs. 19 and 20). Occasionally, the ball-valve action of a stone at the cystic duct may delay emptying (Fig. 21).

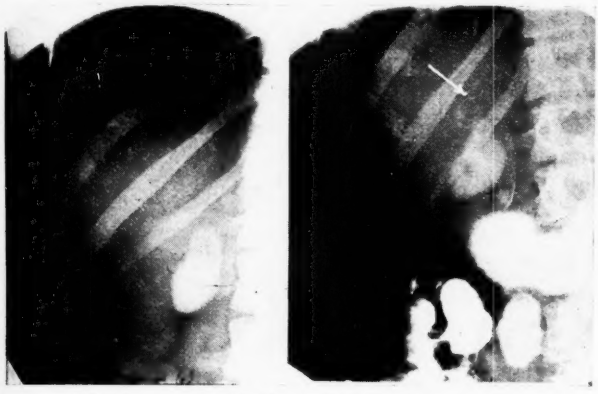


FIG. 21. A. Gall-bladder containing stones, at rest.
B. Six hours after motor meal, showing delayed emptying due to occlusion of cystic duct by two stones (arrow).

We have had the opportunity of reëxamining a small number of patients who had been under medical care following the first examination, from which it appears that cholesterosis is a continuous and progressive cholecystopathy, which is followed by the formation of stones, and, later, by involutionary changes in the entire structure of the gall-bladder.

SUMMARY AND CONCLUSIONS

Complete cholecystographic examination includes observations relative to visibility, mottling, direct and reflex tenderness, mobility, contraction, elasticity and emptying.

In acute cholecystitis there is no visualization associated with sub-costal and reflex tenderness.

Chronic cholecystitis presents a variable shadow, usually fair or poor; local and reflex tenderness; limited mobility; diminished elasticity; weak or absent contractions and delayed emptying.

In the presence of stones, without extensive disease of the vesicle, visibility is usually good; there is direct and reflex tenderness, free mobility and active contractions. "Stripping" usually presents a local bulge corresponding to the site of the stones. Emptying may be normal or delayed, depending upon the patency of the cystic duct during contraction. Good visibility, tenderness, active contractions with delayed emptying, even in the absence of mottling, point to stone.

Adhesions are demonstrated fluoroscopically by diminished or absent mobility, depending upon whether the gall-bladder is adherent to a movable or comparatively fixed viscus.

Abnormal peritoneal attachments produce characteristic deformities of the gall-bladder shadow, and, unless associated with other changes, there is no roentgenologic evidence of cholecystopathy.

Reflex disturbance is shown as a sudden increase in size of the vesicle during contraction, together with nausea or vomiting.

Variations in the anatomical location and relations of the gall-bladder must be considered in the evaluation of roentgenologic findings.

The strawberry gall-bladder is recognized by its good visibility, direct and reflex tenderness, active contractions and rapid emptying.

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DISCUSSION

CHAIRMAN LEONARD: The discussion of this paper will be opened by Dr. Lester R. Whitaker, Boston.

DR. LESTER R. WHITAKER: *Mr. Chairman*—I have been very fortunate in having the advantage of this roentgenological assistance in gall-bladder disease by Dr. Levene. It has been a tremendous help in planning the operations or any other procedures in the treatment of this condition.

Discussion of lantern slides:

A slide was exhibited showing a gall-bladder, containing stones, which gave a dense shadow, was movable under the fluoroscope and contracted after a fat-rich meal. This indicated that the gall-bladder itself was fairly normal; non-adherent; that its serosa could be stripped away readily. It could be removed by sub-serous dissection from above downward, with greater safety, through a smaller incision, and a minimum of trauma to the individual.

A second slide was used to illustrate abnormal peritoneal attachments of a congenital nature about the gall-bladder and duodenum. They have been described often but are seldom recognized by surgeons, being called adhesions. Their

preoperative diagnosis is not easy. They often cause interference with emptying of the stomach, associated with a dragging discomfort in the right upper abdomen and perhaps vomiting. Sometimes the x-ray shows traction defects in the duodenum which may be mistaken for ulcer.

There are one or two other points I should like to mention briefly. Dr. Levene believes in intravenous administration of sodium tetraiodophenolphthalein as the most accurate for cholecystography and I agree with him fully. At the Evans Memorial Hospital he has every facility for carrying out this procedure, including a well-trained resident who gives the injections. Unless such facilities are available, this method is unsatisfactory. The average roentgenologist cannot, or will not perform intravenous cholecystography. We all admit that the so-called "oral method" as now practiced, leaves much to be desired in effectiveness. Some way of improving the oral method, then, is imperative.

An attempt in this direction has been made by Dr. Ellsworth and me at the Massachusetts Memorial Hospitals. We give two full doses of the radiopaque substance as follows: After the noonday meal on the day before the examination, one full dose of the prepared drug is given; and in the evening, after a pure carbohydrate meal, another full dose is given. We have shown by physiological experimentation that carbohydrates do not empty the gall-bladder. The dye that collects in the vesicle from the first dose remains there, and continues to concentrate after the ingestion of the second dose. The next morning there is a much denser shadow of the gall-bladder than would be obtained by the single oral method—in fact, it compares very favorably with that by intravenous administration. The only contraindication to this large dosage is an irritable gastro-intestinal tract.

I wish, in closing, to reëmphasize the great importance of making a careful, detailed preliminary diagnosis. In gall-bladder disease it has to be done by roentgenology chiefly, although the symptoms are of some significance. If you have a clear understanding beforehand of the pathological condition, you can outline a better procedure for the operation. Dr. Osler said that it was surprising how often well-laid plans work out. Such is the case with the work of the surgeon. If he knows, for instance, that the disease is confined to the right upper quadrant of the abdomen, he can make a smaller incision, yet have adequate exposure, and withal lessen the trauma and the danger of postoperative hernia, and shorten the convalescence.

CHAIRMAN LEONARD: I am afraid we shall have to curtail the general discussion of this very interesting question of gall-bladder. We will ask Dr. Levene if he has a final word to say.

DR. LEVENE: Just one word. The double oral dose which Dr. Whitaker mentioned is perhaps a good second to the intravenous administration. However, we prefer the first method as the best method, which leaves no doubt as to the amount of absorption. If there is not a pretty good shadow you are certain the gall bladder is diseased, whereas with oral doses you never know whether the dye has been absorbed by the circulation.

The only other point is that we feel it is unfair to attempt to make the final diagnosis of gall-bladder disease merely on the basis of a film. We believe that fluoroscopic examination, which technique can be very readily acquired and perfected, is just as important in the examination of the gall-bladder as it is in examination of the stomach and intestines.

CHAIRMAN LEONARD. We are taking the liberty at this time to make a change in the order of papers. I should like to have Dr. Krusen give his paper at the end of the session. If Dr. Wyeth is here and ready, we will now hear his paper on "The Treatment of Growths by Electro-Surgery." Dr. George A. Wyeth, of New York.

THE TREATMENT OF GROWTHS BY ELECTROSURGERY*

BY GEORGE A. WYETH, M.D.†

THE ideal treatment of growths has not yet been realized, the reason being that their etiological factors are not yet fully understood. The writer is of the opinion that growths are but local manifestations of an underlying systemic disturbance, possibly endocrine, and a recent serological study[1] has led him to believe cancer to be a disease of disturbed anterior pituitary secretion.

As more scientific knowledge is gained a more rational treatment will be developed. Meanwhile, on the basis of recently established truths, it is now possible for everyone who treats cancer to determine beforehand, or in time to be of service to the patient, the three fundamental points upon which sound treatment is based: (1) the kind of tumor it is; (2) the degree of its malignancy; (3) its quality of radiosensitivity or radioresistance.

Broders[2] has shown that tumors are of various degrees of malignancy according to their cell differentiation; that is, that some tumors

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are much more virulent than others, even though occurring in the same organ.

We know that some tumors grow rapidly, metastasize early and kill quickly, while others are slow-growing, rarely metastasize and with them the patient may live to senility.

CLINICAL-PATHOLOGICAL VARIATIONS IN THE DEGREE OF MALIGNANCY AFFECTING VARIOUS ORGANS

	Low Degree Malignancy	High Degree Malignancy
Skin	Basal Cell Ca.	Melanoma
Breast	Pap. Adenoca.	Anaplastic Ca.
Tongue	Pap. Squa. Ca.	Trans. Cell Ca.
Cervix	Pap. Squa. Ca.	Anaplastic Ca.
Stomach	Linitis Plastica	Diffuse Anaplastic Carcinoma

This knowledge of a tumor can now be gained, in most cases, before treatment is decided upon, by microscopic examination of a fragment of tissue in frozen section. By the cutting current biopsy electrode it is possible to secure such a fragment without prejudice to the patient, and within 15 or 20 minutes to determine the indicated treatment. This can now be carried out as an office routine and I have found it consistently certain, rapid and helpful. If the microscope reveals the tumor as radiosensitive, proper irradiation is immediately instituted.

Regaud, of the Curé Institute, states that only those tumors are amenable to radiation whose radiosensitivity is sufficiently greater than the radiosensitivity of the surrounding tissues to permit destruction of the tumor and conservation of the tumor bed.

As a rule anaplastic tumors are much more sensitive to radiation than are adult tumors. This does not necessarily imply a favorable prognosis, for the most radiosensitive lesions are the most cellular and malignant encountered, and even though they show primary response to radiation the secondary result is often a local recurrence or distant metastasis.

Adult, highly differentiated, radio*resistant* tumors, when in a favorable anatomical location, sometimes respond well to radiation because a sterilizing dose can be administered. When the tumor is characterized by inaccessibility, infection, or extensive disease (or all three) it may fail to respond to radiation therapy.

Unfortunately, clinical observation has shown that even tumors of low-grade malignancy are prone to recur after scalpel removal. Metastasis, due to mechanical dissemination of malignant cells, occurs frequently after scalpel surgery and may be considered a logical sequence, save in early cases. This fact has spurred on our search for a method which should greatly lessen this danger.

It may be said that such a method has been found in electrosurgery, alone or in combination with well-advised radiation. By electrosurgery it is possible to do all that may be done by scalpel surgery, with the added advantage of sealed lymphatics and sterilized tissues. The lymphatics are a closed system of vessels and to remember this is to understand the importance of sealing them off by the clean-cutting high frequency current. This also greatly reduces hemorrhage and shock.

The range of applicability of electrosurgery is very great. There are three currents[3] which may be used singly or in combination one with another. They should not be used one *for* another since each has its own quality and its own indication.

The monopolar current destroys by desiccation. It is applicable to benign and malignant lesions which are superficial in depth, where delicacy of operation and a superior cosmetic result are demanded.

The bipolar current destroys by coagulation. It is applicable to benign and malignant lesions which are more widespread and of deeper penetration. This current is highly destructive and is generally followed by scar formation.

Both these currents destroy the lesion in situ and the use of either of them may be followed by removal of the dead mass by the third, or cutting current, which seals the lymphatics as it cuts.

In carcinoma of the oral cavity the method of choice is electrosurgery. The sterilizing effect of the well-controlled, intense heat on the foul mass (which should be completely destroyed and immediately removed) is such that there is earlier return to normal diet than after any other form of treatment. Thrombosis of the blood vessels is immediate and can be produced to any desired depth. This provides that protection against metastasis which has already been noted. If destruction has been complete, radium implantation is unnecessary. Palpable glands of the neck are removed at the time of ligation of the arteries. Following healing, both sides of the neck are thoroughly irradiated.

To these advantages inherent in electrosurgery is added another, if the lesion to be treated involves an internal organ, for by means of long applicators the cutting current is employed without much of that manipulation which is necessary in such cases if scalpel surgery is employed. This is particularly true in bladder and rectal cases. Along with the development of electrosurgery has come the ball-valve colostomy opening which has been adequately described elsewhere[4]. The redundant gut acts as a plug and keeps the opening closed from the outside except at the will of the patient who has his bowel movements under control. This obviates the "colostomy odor" and makes life more bearable. One such patient has been carrying on regularly with daily bowel movements night and morning, for seven years.

Growths in cavities such as the antrum,

larynx, bladder, et cetera, may be made accessible by the endotherm knife or cutting current and then treated by the established technique of electrosurgery. For radioresistant squamous carcinoma, neurogenic sarcoma and melanoma, with their well-established record of recurrence after scalpel removal, electrosurgery is especially indicated.

NO. 1.

Ball-valve colostomy showing redundant gut affording outside closure of opening, before or after expulsion of feces.

NO. 2.

Ball-valve colostomy opening with redundant tissue pulled down to show lumen of gut.

The surgical development of high frequency currents has made possible a two-step operation by which in extensive cases with glandular involvement we remove first the infected lesion and at a later date the glands. Or at times, extensive lesions are removed and the glands are coagulated in situ and left to be absorbed. This is of enormous advantage to the patient and opens up an avenue of approach for many of those so-called "inoperable" radioresistant lesions in the treatment of which no other method has much to offer. Here electrosurgery has won for itself a high place. In so brief a statement as this we are obliged to omit more than passing mention of the especially favorable technique for such conditions as plantar warts, pigmented nevi, cavernous angiomas, caruncles, epulis, ranula and sebaceous cysts. These new truths will soon have their proper place in medical teaching. In the meantime special notations should accompany reports of results in the treatment of growths.

One surgeon reports a high percentage of five-year cures in "carcinoma of the tongue", while another, equally skilful, seems on the face of his report to do not half so well. The veracity of both men is unquestioned but we should be told how many of the first surgeon's cases were simple, papillary squamous carcinoma, and how many transitional cell carcinomas fell within the second man's report. Without this information reports have not great value.

Healy and Cutler[5] have shown 42-66 per cent of five-year cures in anaplastic carcinoma of the cervix by radium treatment, while results on this lesion by scalpel surgery at Johns Hopkins and the Mayo Clinic, they report as showing only nine per cent. This illustrates the wisdom of knowing beforehand the kind of tumor to be treated.

Although electrosurgery is simple in its handling, easy of control, cleanly in use, the operator must take the time and trouble necessary to learn its technique and should have had, before beginning, a sound surgical training.

The cutting current was perfected in 1923-1924 and was presented by the writer before the Surgical Section of the N. Y. State Medical Society at Rochester, in April, 1924. The full report was published in May of that year[6]. The years since have witnessed the application of electrosurgery to many conditions and much testimony from many quarters has been given of the wide adaptability of the cutting current. In my opinion the greatest usefulness of electrosurgery is and will be in the treatment of cancer.

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Discussion

Chairman Leonard: The discussion of this paper will be opened by Dr. Edward H. Trowbridge, of Worcester.

Dr. Trowbridge: *Mr. President and Members of the Society*—It affords me great pleasure to listen to this most admirable presentation of the use of electrosurgery in various growths.

Through a monograph sent me, by Dr. George A. Wyeth, and his book published in 1926, I became interested in this new and scientific surgical procedure, and I deem it a privilege to extend my congratulations to Dr. Wyeth in the wonderful work in which he is engaged and wish him continued success and renown.

Since April, 1927, I have used the electrosurgical knife at the Harvard Private Hospital in Worcester, in all abdominal incisions and such operations as amputation of the breast, thyroidectomy, cholecystectomy, appendectomy, herniae, cystotomy, hysterectomy, salpingectomy, cesarean section, abdominal adhesions and trachelorrhaphy, and in none have I had any complications, except one of my early cases of cystotomy for calculi in a patient 74 years old, i.e., a slough in the wound.

The results have been most satisfactory, the wounds healing by first intention and not complicated by any of the unfortunate conditions as described by those whose technique has been faulty, which has led to unexpected complications causing the operators to abandon the use of this unit.

It has not been my privilege to see or treat the varied cases of malignancy such as Dr. Wyeth has portrayed on the screen to-day.

Our use of the electrosurgical knife in all cases has supplanted the use of the scalpel.

Time does not allow me to take up some of the important features of all the various operations in which we have used the electrosurgical knife, but will briefly refer to some of the essentials in a few of the major operations.

In breast amputations, the axillary vessels are protected by the wooden tongue depressors; and very few hemostatic forceps required though the larger vessels are ligated.

An exceedingly important phase of using the knife in breast cases is to sever the costal attachment by holding the blade practically parallel to the chest-wall and not at right angle, and to do the cutting when the act of expiration is in force and not the act of inspiration. I have cut through the pleura in two cases because of a sudden inspiratory movement.

In cholecystectomy cases, special care is necessary in severing the cystic duct; notwithstanding the deep location of the point of severance, the operative field is rendered clear as there is practically no oozing when so employing the electrosurgical knife.

I have been greatly pleased with the use of the electrosurgical knife in cesarean section. While formerly using the scalpel in such operations; the electrosurgical knife does have a noticeable effect in more suddenly and more effectively causing the vessels to contract, and hence, that sudden gush of blood, when the uterine wall is incised, is not so profuse and persistent and the suturing of the uterine incision is performed more satisfactorily. So much for major work.

In closing this discussion, let me briefly allude to the use of the bipolar current in treatment of cervical erosions and caruncle of the urethra.

I have been using, for the past several weeks, the Remington outfit attached to my Bovie unit and feel assured that this new technique greatly surpasses the old in the treatment of the abovementioned conditions.

Let me say, in closing, if any of you gentlemen should use the electrosurgical knife, in my judgment faulty technique is what prevents many a man today from its employment. If you are going to indulge in any of the carcinomatous cases, see how you can do it with the scalpel and compare that with what you can do with the electrosurgical knife. I have had one of the most inoperable cases of carcinoma of the tongue, and I wanted to do the whole operation by electrosurgery. It was a radioresistant tumor, and that woman suffered untold tortures since last December from the enormous amount of radium that was used on that tongue, with sloughing extending to the root of the tongue. I want to commend to you the use of the electrosurgical knife in your surgery, not only in the malignant cases but in clean surgical operations.

I thank you.

Chairman Leonard: In closing I will ask Dr. Wyeth if he has anything further to add.

Dr. Wyeth: The only further word I would like to add is simply to emphasize Dr. Trowbridge's last remark. If you are going to use electrosurgery let me urge you to take the time and trouble to acquaint yourselves with high frequency currents and their application to electrosurgery. Listen to, but do not be carried away by, the over-zealous remarks of enthusiastic salesmen.

Chairman Leonard: We have two papers left, and I think we have plenty of time for them. As I announced previously, Dr. Krusen's paper will be read last. He has some moving pictures to show. So the next paper will be "Colon Irrigation in the Treatment of Mental Disease", by Dr. Harold K. Marshall, Gardner State Colony, East Gardner, and Dr. Charles E. Thompson. Dr. Marshall.

COLON IRRIGATION IN THE TREATMENT OF MENTAL DISEASE*

BY HAROLD K. MARSHALL, M.D.,† AND CHARLES E. THOMPSON, M.D.†

THE purpose of this article is to present a report of the result of the treatment of mental disease by the use of colon irrigation at the Gardner State Colony and to call attention to the possible wider value of this procedure in medical and surgical problems.

The first use of the enema dates back to the earliest days of our civilization, but the colon irrigation as practised today is of recent origin. The literature on this subject previous to an article by Mills and Bird[1] (1919) is scanty. These authors call attention to the beneficial use of colon irrigation in children with elevation of temperature, constipation, gas in the intestines, and in children needing mental sedation.

Bodkin[2] (1921) recommends this procedure and gives a technique which does not vary much from that used at the present time. Zobel[3] (1921) notes its efficacy in certain surgical cases, and advises caution in the technique. Schellberg[4] (1923) writes comprehensively of the technique of performing the procedure. Blackman[5] (1925) insists that the colon becomes engorged by neglect and emphasizes the necessity of keeping it clean by the use of irrigation. Shaine[6] (1926) concludes that many patients with chronic constipation are relieved by the use of colonic irrigation when medical treatment has failed. Snyder and Fineman[7] (1927) note beneficial results in arthritis, and publish a series of roentgenograms of colons illustrating their views. They credit Dr. Lockwood of New York with being the first physician to use this procedure. Rendall[8] (1929) notes that colon irrigation cannot be expected to produce permanent results unless focal infective areas in other parts of the body when present are found and removed. She states that many mental conditions, and some forms of asthma, neuritis, sciatica, gout and rheumatism are benefited. She recommends that the irrigation be administered together with abdominal massage. Rowell[9] (1929) cites cases of arthritis, high blood pressure, sleeplessness and vertigo which were relieved by this form of irrigation. Shillito[10] (1930) reports efforts to aid the detoxicating effects of the liver by colon irrigation containing manganese as potassium permanganate, gr. 1 to one pint or one and one-half pints of water. By mouth he administers thyroid extract, as this substance is an activator of oxidative processes. Kaiser[11] (1930) reports the result of his investigations of the normal evacuation time of the colon and found it to be 36 to 48 hours. Investigating the evacuation time of the colon in three groups of mental cases he reports his results as follows: dementia praecox 113 hours; manic depressive psychosis 154 hours; psychoneurosis 80 hours. After treating patients in each of these groups by colon irrigation he reports that of his dementia praecox cases 17% recovered; of his depressive psychosis cases 70% recovered; of his psychoneurosis cases 80% recovered. Of the total cases, all groups, 40% recovered, 33% improved, and 57% were released on visit. Jameson[12] (1930) states that 36 toxic substances; indol, skatol, phenol, botulin, triptophan, for example, exist in the colon and that the reason that people can endure colon stasis is because of the detoxicating effect of the liver. He quotes Widal, Abrami and Iancovesco[14] to prove that blood in the portal vein is not detoxicated and when the portal vein in animals is anastomosed into the inferior vena cava so that this blood enters the general circulation hemoclastic shock results every time following feeding. Jameson, therefore, believes that the liver is a buffer and that the detoxicating effect of this organ is sufficient to prevent the entrance of deleterious disintegrating products of colonic putrefaction into the general circulation. He concludes that colon irrigation is of value in mental and nervous states, certain forms of chronic nephritis and deforming diseases of the joints. Morse[13] (1930) writes of the benefits to be derived from this practise and of the technique and to Dr. Morse we are much indebted for his advice and assistance. He has visited us and aided us by suggestions and advice. Cotton[15], in a report from the Trenton State Hospital, makes favorable comment upon this procedure when employed in the treatment of mental diseases.

ANATOMY

The cecum is a blind sac occupying the right iliac fossa extending downwards 3″-4″ below the ileocecal junction. From the posterior left surface the appendix projects. The appendix internally opens about one inch below the ileum. Guarding the opening into the ileum is the ileocecal valve consisting of two cusps which project from the ileum into the cecum.

The ascending colon runs up from the cecum to the hepatic flexure. It is about eight inches long and comes in contact posteriorly with the abdominal wall and right kidney. The transverse colon is variable in arrangement and position. It runs transversely and upwards to the splenic flexure and the spleen may make an impression on it. It is bound to the diaphragm

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opposite the eleventh rib by a fold of peritoneum. Its average length is twenty inches in the adult, but it varies from twelve to thirty-three inches. The descending colon from the splenic flexure to the commencement of the sigmoidal loop averages eight and one half inches in length. The sigmoid flexure forms a loop similar in shape to the Greek capital letter Omega. The rectum is about five inches long. The total length of the intestinal canal from the cecum to the anus is about fifty-nine inches.

Blood Supply. The colon is supplied by branches from the superior and inferior mesenteric arteries while the rectum is supplied by the middle hemorrhoidal from the internal iliac and by the inferior hemorrhoidal artery. The returning blood of the large intestine flows into the portal vein through the superior mesenteric and inferior mesenteric veins. At the rectum a communication is set up between the systemic vein and the portal system of veins. Some of the blood from this part (the rectum) flows directly to the internal iliac veins and does not return through the portal vein.

There are four coats, serous, muscular, mucous and submucous. The serous coat is formed by the peritoneum; the muscular by the circular and longitudinal muscle layers, the longitudinal being external; the mucous membrane is separated from the muscular layer by the submucous layer. It has no villi and no valvulae conniventes.

PHYSIOLOGY

Both intestinal juices and unabsorbed food are subjected, particularly in the large intestine, to the decomposing action of myriads of bacteria, and the products formed are of the greatest importance. Many of them are toxic, producing headache, drowsiness, or at times irritability or depression and anemia. The toxic substances are derived chiefly from proteid putrefaction—the carbohydrates being decomposed by fermentation. There is, however, no essential difference in kind between fermentation and putrefaction except that fermentation implies the liberation of a gas. Bacteria are found in every part of the intestinal tract but in increasing numbers as the lower bowel is reached so that in the colon great quantities are found.

It is rather difficult to compute the number of bacteria in the colon. It has been estimated that normal individuals excrete approximately 500×10^{10} living and dead bacteria per day in the feces. Again it has been estimated that the average weight of dried feces passed per day is 15-25 gms., and that of this amount 4-5 gms. consist of bacterial bodies.

Carbohydrates are decomposed chiefly into CO_2 H_2 CH_4 and N_2, lactic acid and alcohol. The last two are re-absorbed and burned up by the metabolic processes. Other products are formed but their nature is obscure. So far as is known none of these products are harmful but the gas formed may be distressing.

The bacterial decomposition of fats is not well known for it has not been studied. Fats are saponified by the action of the bile and pancreatic juices, but fat globules are often found in feces. It is possible that their decomposition products may produce harm if absorbed. The decomposition of proteins is a very complex subject. The amino acids which are the result of enzyme action and which are assimilated by the body for replacement of tissue wear and for growth are attacked by bacteria and broken down into toxic substances such as phenol, cresol, indol and skatol, and hydrogen sulphide. These products when reabsorbed are detrimental to the living organism and produce nausea, vomiting, diarrhea, headache and mental disturbance in varying degrees.

These products produced by the attack of bacteria upon the amino acids are made chiefly in the absence of carbohydrates, for it has been found that when carbohydrates are present they do not decompose the amino acids. It is only in the absence of carbohydrates that the bacteria work on proteins. When peristaltic action is delayed, thereby prolonging the evacuation time of the large bowel, we find an indication for colonic irrigation.

Food normally begins to enter the colon in about four hours after ingestion and the meal passes completely into the large bowel in about six hours. There it remains for from ten hours to forty-eight hours. The absorbing powers of the large bowel are very great, products formed there entering the blood stream if not detoxicated by the liver. They are excreted by the urine, perspiration and breath.

At the Gardner State Colony, treatment of mental patients by colonic irrigation methods was inaugurated in May, 1930. A large number of patients have been under treatment by this method. Although this work has not been completed, it has been possible to draw conclusions of interest to psychiatrists as well as to internists and surgeons.

In our experience cases of manic depressive psychosis experiencing a manic episode show a quicker return to normal mentality when the colon is kept well irrigated. This we attribute to three factors: removal of toxic products from the colon, pointed out by Jameson; relief of the dehydrated condition of the tissues, and relief of acidosis. Most manic depressive cases are constipated, dehydrated and acidotic to a varying degree from semi-starvation due to neglect previous to admission. Regarding high blood pressure it has been interesting to observe that hypertension does not appear to be an etiologic factor in the production of a manic phase of a manic depressive psychosis. We have noted that a fall in blood pressure takes place concomitantly with a return to normal mental stability but that a rise in blood pressure subsequently does not provoke a psychotic episode.

In dementia praecox cases, results have not

been outstanding from a psychiatric standpoint. Physically, however, improvement is generally noticed and, as the colon is not permitted to become congested, many who are inclined to be objectionable in their habits become less so. Dementia praecox patients are certainly quieter and cleaner under this type of treatment. Other types of mental disorder show improvement in mental and physical health.

Surgically it has been observed that colon irrigation is of value in the preoperative preparation of patients prior to laparotomy. Stagnate intestinal contents and gas-producing material have been removed to a considerable extent with the result that convalescence is markedly more comfortable and the usual abdominal distention with resulting pain has been absent. Our consulting surgeon, Dr. Lowell, quickly noted beneficial results after this treatment was inaugurated.

Medically it has been observed that in patients with high blood pressure a rapid fall of pressure takes place amounting to 20 to 30 mm., of mercury before completion of an irrigation, the time of giving of which averages about 44 minutes. This fall in blood pressure is not prolonged, as it rises within twenty-four hours to its former height. However, after a period of daily colon irrigation a gradual fall of the systolic pressure takes place until that pressure is maintained at about 20 to 40 mm. of mercury below the former high blood pressure. This drop in the blood pressure obtained during the first irrigation suggests that cases of hypertension with cerebral hemorrhage and cases of eclampsia might be helped by the judicious application of this treatment.

Approximately 200 colon irrigations are being administered monthly at the Gardner State Colony. No untoward results have been noted in any case. It is unnecessary to employ elaborate apparatus or elaborate solutions. Good results can be obtained with weak solutions of sodium bicarbonate, one-half normal saline solution and weak solutions of tincture of green soap. Special preparations are, of course, used where indicated, as for example Irrigol, Kaolin and Neo-silvol. The quantity of fluid used during an irrigation will vary from ten to twenty gallons warmed to a temperature not to exceed 110° F. The amount is determined by the result. The rule should be to wash until a clear return is obtained, irrespective of the amount of fluid used or the time consumed, being governed by the general condition of the patient. The inflow tube should not be allowed to become clogged. Roentgenograms following barium enemas in order that colon abnormalities may be noted are recommended. These are not obtainable in non-coöperative subjects. They are desirable but not essential if care and consideration are given each case. The sine wave current is advised as an adjunct to the irrigations in coöperative patients.

We use the Vattenborg apparatus and have found it satisfactory. We have both mobile and wall units. Each has its use. We have one table which has innovations suggested by us and another table planned by Dr. Rebekah Wright, both of which are satisfactory. These tables have flush basins and are easy to work with, but with the mobile unit which includes a five gallon container to catch the return flow, irrigation can be done at the bedside or on a plain table.

The position of a patient during an irrigation may be varied. He may first be on the left side, then on the back and then on the right side. From our experience with non-coöperative patients we find little choice. Results obtained are good in all the positions mentioned. We have also administered barium enemas in different positions and have not noted any outstanding differences in the result.

CONTRAINDICATIONS

Inflammatory intra-abdominal conditions with or without pus; malignancy or ulceration of the rectum; incompetent ileocecal valve; hemorrhoids during an acute exacerbation are contraindications.

SUMMARY

Colon irrigation does not appear to exert any specific action; it merely aids in combating a number of abnormal conditions. By cleaning out the colon the system is afforded relief from toxic products and an unnecessary burden is removed from metabolic processes; by its mechanical cleansing action cleanliness in habits is promoted; by the absorption of fluid from the colon, which takes place during treatments, dehydration is relieved.

From our experience this treatment produces a quicker return to mental stability in our opinion in favorable cases. In active cases sedation is unquestionably obtained, strikingly shown by a reduction in the number of wet sheet envelopments required, which prior to this form of treatment numbered from anywhere up to nearly 500 monthly. Since the use of colon irrigation, wet sheet envelopments have fallen to less than sixty monthly and sometimes none at all. From the standpoint of the hospital, it is interesting to note that the destruction of mattresses, sheets and clothing has fallen off approximately fifty per cent.

Our results may be given as follows: From June, 1930 to May 1, 1932 we have given 5,468 colon irrigations averaging forty-four minutes each to 191 different patients. This represents between one fourth and one fifth of our population which in round numbers is 1350.

RESULTS	
Home	23.5%
Improved	
Physically	19.9%
Mentally	13.6%
Unimproved	
Physically	11.8%
Mentally	17.0%
Intercurrent diseases contraindicating	8.4%
Insufficient Treatment	5.7%

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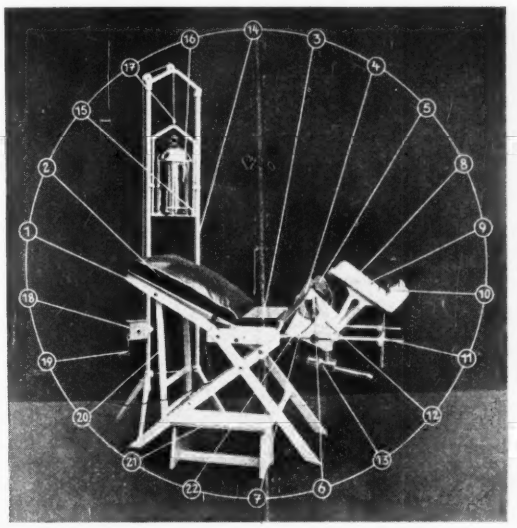
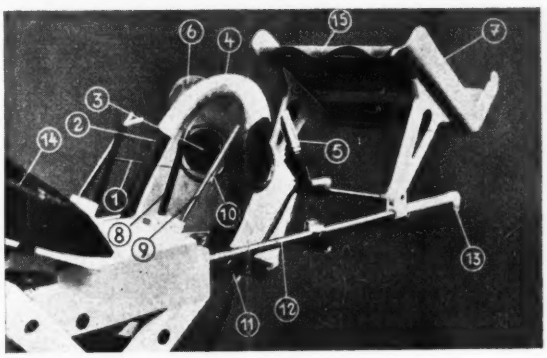
Discussion

Chairman Leonard: I am afraid, in order to give the last speaker his proper quota of time, we will again have to cut short the general discussion of this subject, but we still have a minute or two left if anyone wants to use it.

Dr. Arthur H. Ring, Arlington Heights: *Mr. Chairman*—I have done some of this work, and I wanted to put on two or three pictures of the machine we use, obtained by us in Germany, which I believe is the only one in this country, and I think it will be interesting to see one of the newest types of colonic irrigation machines. It was invented by Dr. A. de Borosini and he calls it the Gymnacolon.

As you see, the chair-table is so constructed that the patient can get complete relaxation with the legs semi-flexed. The water can be raised or lowered to regulate the pressure. The rectal tube is of only one-half inch diameter and is inserted about three or four inches. The patient is instructed to make no effort either to retain or expel the water but to relax and let it flow in and out, this continuing for one-half to one hour. Solvents may be added to the water, but we prefer tap water as a rule at about 100°F.





We have found that patients who had had other methods of high colonic treatment and disliked them very much are perfectly willing to take this treatment and they get great comfort from it. Certainly it has been a tremendous benefit in many toxic conditions, not only in the psychoses but the neuroses, and in many general conditions. No griping or pain accompanies its use and it has proved an excellent sedative and rejuvenator as Dr. Marshall points out.

Chairman Leonard: We now have time only for the last paper on our program, "Physical Therapy: An Aid to Routine Medical and Surgical Practice", by Dr. Frank H. Krusen, of Philadelphia.

PHYSICAL THERAPY: AN AID TO ROUTINE MEDICAL AND SURGICAL PRACTICE*

(A Motion Picture Demonstration)

BY FRANK HAMMOND KRUSEN, M.D.†

PHYSICAL therapy, as a branch of medical practice, has developed rapidly within the past few years. While it is still in its infancy, nevertheless, steps have been taken to insure that the infant is lusty. The American Medical Association has organized a Council on Physical Therapy which has contributed largely to the establishment of this field on a sound superstructure. Their recently published *Handbook of Physical Therapy* is well worth reading. Massachusetts has set an excellent example by establishing in its State Society the Section which I address today. Numerous other state and county societies have organized committees on physical therapy.

Because of this rapid growth of physical therapy, it behooves every physician to familiarize himself with at least the rudiments of physical therapy practice. It is with the thought of aiding interested physicians thus to acquaint themselves with the basic principles of physical therapy that I have prepared the motion picture which I show you today. In preparing this demonstration, I have frequently quoted my previous writings on the subject. DaCosta has said, "Such quotations may mean scantiness of mental resource, but may also be due to profound conviction. If one believes, he must preach and repeat." I trust that you will be generous enough to believe that I have a profound conviction that physical therapy is of great value as an adjunct to routine medical and surgical practice, when it is properly understood and applied. This branch of medicine also has distinct limitations.

RÉSUMÉ OF MOTION PICTURE

Physical Therapy has been defined by the Council on Physical Therapy of the American Medical Association as "The use of the physical, chemical and other properties of light, heat, water, electricity, massage and corrective exercise in the treatment of disease."

Physical therapy may be divided into four main branches:

1. Electrotherapy.
2. Phototherapy.
3. Hydrotherapy.
4. Mechanotherapy (massage and corrective exercise).

*Presented at the Annual Meeting of the Massachusetts Medical Society before the Section of Radiology and Physiotherapy at Boston, June 9, 1932.

This, of course, loses much of its value without the illustrating motion pictures; however it gives some suggestion of the presentation.

†Krusen—Director, Department of Physical Medicine, Temple University Medical School. For record and address of author see "This Week's Issue," page 474.

1. *Electrotherapy*

The treatment of disease by means of electricity. The Father of Electrotherapy was William Gilbert (1540-1603). There are several types of current used in electrotherapy. They are the following:

1. The Galvanic (or Constant) Current. 2. The Interrupted Galvanic Current. 3. The Faradic (or Induced) Current. 4. The Sinusoidal Currents.	The Low Voltage Currents.
5. Static (or Frictional) Electricity 6. The High Frequency (or Diathermy) Currents.	The High Voltage Currents.

"The Galvanic Current may be defined as unidirectional current of relatively low voltage and amperage, with distinct and important polarity, and with marked medical and surgical ionic properties." Granger.

The currents flowing from the positive and negative poles of a galvanic machine produce distinct and diametrically opposite chemical effects on the body tissues.

The properties of the currents coming from the poles may be listed as follows:

Positive Pole	*Negative Pole*
Attracts O_2	Attracts H_2
Acid	Alkaline
Hard Scar	Soft Scar
Dehydrates Tissues	Liquefies Tissues
Vasoconstrictor	Vasodilator
Causes Ischemia	Causes Hyperemia
Stops Bleeding	Causes Bleeding
More Germicidal	Less Germicidal
Sedative—Primary Use—Stimulating	
Repels Bases Metals Alkaloids	Repels Acids Acid Radicals Halogens
Corrodes Metals by Oxidation	Will not Corrode Metals
Acid Caustic	Alkaline Caustic
Relieves Pain in Congestion	Causes Pain (except in certain cases in which there is Ischemia)

In order to use the galvanic current intelligently, one must know the polarity.

Tests for polarity.

1. Soak a piece of paper in a solution of po-

tassium iodide. Then run the cord tips from the galvanic machine across the paper (with the current turned on).

A brown streak of free iodine will appear at the tip connected with the *positive* pole.

Bubbles of hydrogen will appear at the *negative* pole. To remember this, say: "That pole which does *not* bubble is *not* the *negative.*"

The galvanic current may be used to carry therapeutic ions into very superficial tissues; i.e., "in inflammations due to bacterial infection of the skin and mucous membranes".

Zinc ionization for bactericidal effect in a selected case of chronic otitis media.

The galvanic current may be interrupted or waved to produce muscular contractions.

The interrupted galvanic current may be graphically represented as follows:

The smoother and more pleasant waved galvanic (or sinusoidal) current may be graphically represented as follows:

The sinusoidal current offers a means of producing readily controlled and modulated contractions of muscles or groups of muscles.

The sinusoidal currents are especially valuable in the treatment of atrophied muscles, in lower motor neuron lesions (Infantile Paralysis, Erb's Paralysis, Bell's Palsy, etc.).

There are many types of apparatus for the production of galvanic or waved galvanic currents.

A commonly used apparatus known as a galvanic wave generator.

Another type of galvanic wave generator.

Another apparatus for the production of the galvanic and of the faradic current (known as a portable wall plate).

Various moist pads and metallic forms are used to conduct the galvanic current to parts of the body.

The faradic and galvanic currents are used to test for the reaction of degeneration.

A case of right facial paralysis tested with the faradic current.

Normal response to faradic stimulation on the unaffected side.

No response on the affected side.

If an electrical current is made to alternate *very* rapidly, it may be passed through the body without causing muscle contractions or shock.

Such a current oscillates at a rate of 1,000,000 to 3,000,000 times per second, and is known as a high frequency current.

It produces resistance heat in the tissues.

The high frequency current is produced by an oscillatory discharge from a condenser and may be graphically represented as follows:

This current, because it alternately rises to a peak and then *damps* down, is called a *damped* high frequency current.

When this current is passed through parts of the body, by means of metal electrodes to produce mild heating effects, it is known as medical diathermy.

By properly placing the metal electrodes, one may produce deep local heat in almost any area of the body.

Medical diathermy to the fingers.

Medical diathermy to the elbow.

Medical diathermy to the chest.

The same diathermy current may be applied through large surface electrodes to raise the temperature of the entire body, if the body is properly insulated by means of blankets.

Technic for the production of fever by diathermy.

Preparation of the bed. Two blankets, a rubber sheet and a muslin sheet are spread.

Then a binder, a pad, and the back electrode are placed in position.

Then the front electrodes are applied and the binder is tightened.

Another rubber sheet and blanket are spread over the patient. Then all the coverings are wrapped around the patient and pinned.

The electrode cords are connected to a heavy duty diathermy machine.

The patient is given a hypnotic before treatment.

The temperature, pulse and respiration are taken before treatment and every fifteen minutes during treatment.

The current is turned on gradually and the treatment continues for several hours (approximately 3 to 6), the temperature gradually rising under complete control.

This method has recently been used as a safe method of producing controlled therapeutic fever in the treatment of paresis and other chronic infectious diseases.

If this *same* damped current is concentrated at the tip of a needle, the resistance heat in the tissues will become so great that they will be destroyed.

This is known as surgical diathermy.

Surgical diathermy being employed for the removal of moles.

Demonstration of surgical diathermy on meat.

a. Fulguration—Needle held short distance from surface which is showered with sparks. *Very* superficial destruction. Carbonization.

b. Desiccation—Needle brought in contact with or introduced just below surface, *less* superficial destruction. Dehydration.

c. Electro-coagulation—Indifferent metal plate placed on one surface and needle introduced into other surface. Deeper destruction. Coagulation.

These methods of tissue destruction bear no relation to the cautery. The needle remains cold. The heat is generated in the tissues themselves,

due to the resistance they offer to the flow of the current.

The *damped* high frequency current will not suffice for cutting tissues.

To obtain a cutting current, one must have a special apparatus which will produce an *undamped* current.

The undamped high frequency current used for cutting may be graphically represented as follows:

The cutting current destroys tissues by endogenous disintegration. It makes an incision with a thin film of coagulation on the cut surface, which seals small blood vessels and lymphatics.

The cutting current through a metal loop offers a nearly ideal method for taking tissue for biopsy.

2. *Phototherapy*

The treatment of disease by means of light rays (visible and invisible).

The Father of Phototherapy was Niels Ryberg Finsen (1860-1904).

The sun's rays may be shown to be split by a prism into the following component parts.

Beyond the red end of the visible spectrum are the long invisible infra-red rays.

These are penetrating *heat* rays, which are produced for therapeutic purposes, from luminous and non-luminous sources.

Infra-red generators (non-luminous). Carborundum plates or coils of resistant metal placed in a reflector produce invisible infra-red rays.

Infra-red rays are used in sprains, contusions, fractures, myositis, neuritis, arthritis, endarteritis, etc.

Application of infra-red rays to a hand.

The radiant heat generator (luminous). An incandescent lamp placed in a reflector produces visible light, but the infra-red or heat rays predominate.

Radiant heat applied to the lower extremities.

The electric cabinet bath consists of a large number of incandescent lamps in a cabinet lined with mirror reflectors.

It supplies radiant heat to the entire body. It is used in selected forms of arthritis and nephritis, in early arteriosclerosis, in obesity and in toxemias.

Beyond the violet end of the visible spectrum are the short invisible *ultraviolet* rays.

These are slightly penetrating chemical rays.

Ultraviolet rays are produced artificially by means of a quartz enclosed mercury vapor arc, or by a carbon arc in a reflector.

Ultraviolet rays are applied in ascending doses to the entire body, with the artificial source about 30 to 40 inches distant, in rickets, tetany, extrapulmonary tuberculosis, secondary anemia, etc.

Applied locally at short range, the ultraviolet rays are bactericidal and cytocidal.

Local applications are best made with a quartz mercury vapor arc enclosed in a water jacket, to which various sized quartz applicators may be attached.

The rays are conducted through the applicator to the part to be treated.

Water-cooled ultraviolet lamp with quartz rod applicator used for bactericidal effect in the ear.

3. *Hydrotherapy*

The treatment of disease by the application of water in its various forms to the surface of the body.

The Father of Hydrotherapy was Vincent Preissnitz (1790-1852).

One of the most valuable pieces of hydrotherapeutic apparatus is the whirlpool bath.

This bath of whirling aerated water at a temperature of 110° F., applied to the extremities, produces marked hyperemia, relaxes the muscles, is sedative, and has a gentle massage effect.

The whirlpool bath is an excellent preliminary to manual massage and corrective exercise. It is used in fractures, dislocations, contusions, for painful amputation stumps, etc.

The arm whirlpool bath.

The leg whirlpool bath.

The apparatus in a hydrotherapy room is controlled from a central table known as the Baruch control table.

From this table, the temperature and force of the water in the needle shower, Scotch douche, tub bath, sitz bath, etc., are regulated.

The horizontal jet douche.

The fan douche.

Patient in needle shower.

Patient receiving the Scotch douche (alternate jets of hot and cold water).

4. *Mechanotherapy.*

The treatment of disease by means of massage and corrective exercise.

The Father of Mechanotherapy was Pehr Henrik Ling (1774-1839).

Massage may be divided into five main methods.

1. Effleurage.
2. Pétrissage.
3. Tapotement.
4. Friction.
5. Vibration.

Effleurage—Long centripetal stroking.
Pétrissage—Kneading.
Tapotement—Hacking, Tapping, Beating.
Friction—Circular rolling motion.
Vibration—Vibratory movement of fingers or palm.

Since manual vibration soon tires the operator, mechanical vibration is usually substituted.

Corrective exercise may be divided into four main methods.

1. Passive exercise.
2. Active assistive exercise.
3. Active exercise.
4. Active resistive exercise.

Passive exercise—Patient remains relaxed or *passive* while the operator moves the part.

Active assistive exercise—The patient makes an *active* effort to move the part and the operator *assists* him to go farther.

Active exercise—Patient makes an *active* effort to move the part without aid from the operator.

Active resistive exercise—The patient makes an *active* effort to move the part and the operator *resists* each effort at motion.

Active exercises are extremely valuable in overcoming spinal deformities.

A case of scoliosis. S-shaped lateral curvature of spine. (The dots [shown in motion picture] mark the position of spinous processes of the vertebrae when the patient stands at rest.)

Some of the exercises used to correct the deformity. This case has received only eight treatments.

The dots show position of vertebrae when at rest; line shows position of vertebrae when the patient assumes corrective position.

Other exercises.

Another case of scoliosis. This case had a worse curvature than the first when she started treatment. She has received 25 treatments.

Some of the exercises.

The auxiliary treatment of fractures is a routine procedure in the physical therapy clinic. Disability may frequently be shortened by early application of physical therapy.

A patient with a recent Colles' fracture going through the usual clinic routine.

Entering the clinic.

Registering.

Proceeding to chief technician's desk.

Examination and treatment outlined by physician.

Infra-red treatment to fractured wrist. This lasts for twenty minutes.

Massage. This lasts for 10 minutes.

Corrective exercise for 5 minutes.

Splint discarded. Wrist bandaged.

Patient given another appointment.

Physical therapy is an excellent adjunct to regular medical and surgical treatment. It frequently offers a tangible means of relieving pain and suffering and of shortening the length of patients' disability.

Discussion

(This topic was discussed by Dr. William D. McFee, of Haverhill.)

Chairman Leonard: The Annual Meeting of the Massachusetts Medical Society, I believe, is already in session. We have gone a few minutes over our time, and I think for that reason that probably we will have to call this session closed. I should like, however, to ask Dr. Krusen if he has anything to add.

Dr. Krusen: I have nothing.

Secretary Trowbridge: I should like to move a vote of thanks to Dr. Krusen, Dr. Butler, Dr. Wyeth, Dr. Marshall, and Dr. Levene for presenting us with these valuable papers this morning. They have been instructive, and we have enjoyed them very much, and I so move, Mr. Chairman.

Said vote, being duly seconded, was carried by a rising vote.

Report of Nominating Committee

The Chairman during the session appointed the following Nominating Committee: Harvey W. Van Allen, Springfield; Patrick F. Butler, Boston; Arthur L. Brown, Winchester.

The Committee retired and returned with the following nominations:

For Chairman, Edward H. Trowbridge, Worcester.

For Secretary, Charles W. Blackett, Jr., Newtonville.

Upon motion, duly made and seconded, it was

Voted: To accept said report, and that the Secretary be instructed to cast one ballot for said nominees.

The Secretary having cast the ballot as directed, the Chairman declared Dr. Trowbridge and Dr. Blackett elected to their respective offices for the ensuing year.

Meeting adjourned.

RECURRING INTESTINAL OBSTRUCTION BY GALL STONE

BY P. H. COOK, M.D.,* AND ROYAL P. WATKINS, M.D.*

A NUMBER of reports of cases of intestinal obstruction by gall stones have appeared in the literature, but it is nevertheless a rare condition. The recovery of a second stone after operation for the obstruction by the first one, and particularly the x-ray findings seem to make this case unique and worth reporting.

In all the reports which have come to our notice the nature of the obstruction was diagnosed before operation in only one.

The mortality was about 60%.

An analysis of these cases leads to the conclusion that the chief reason for the high mortality was the failure to recognize, not the nature of the obstruction, but the fact that obstruction was present. In most of the cases this fact was not realized until the condition of the patient was very grave.

Another reason for the death of the patient in a few of the cases was too much surgery. The surgeon was not content merely to relieve the obstruction but felt it necessary also to take care of the conditions which made the obstruction possible. This led to quite extensive operation on a patient in very poor condition. It would seem that the removal of the gall bladder and closure of the fistulous opening in the duodenum, as was done in one case, might better have been postponed until the patient had recovered from the immediate effects of the obstruction itself.

FIG. 1.

The early diagnosis of obstruction in these cases is not always easy. The obstruction may not be complete at first and the symptoms are very apt to be intermittent over a period of many days or even of some weeks. By the time the obstruction becomes complete and therefore evident, the gradual absorption of toxic products has made the condition of the patient a very serious one.

As to the diagnosis of the cause of the obstruction: In most of the cases there had been no history pointing to gall bladder trouble. In

*Cook — Roentgenologist, Worcester City, Hahnemann and Worcester Memorial Hospitals. Watkins — Surgeon-In-Chief, Fairlawn Hospital, Worcester. For records and addresses of authors see "This Week's Issue," page 474.

some there had been such history, but a long time before, and not disclosed until after the operation. The case here reported is the only one we have found in which any history had been elicited indicating even the probable time at which the stone had ulcerated through into the gut. Even in this case there was nothing really typical in the story and it did not suggest to any one at the time any connection with the obstruction, and may not have had any. This part of the story is as follows:

In the early spring of 1930, after a trip to Italy, the patient was sick for several weeks with indefinite abdominal distress, vague generalized symptoms and a temperature from 100° to 101°. Typhoid fever was suspected but could not be verified. She was not well all summer. In the early fall she had another similar attack. Following this she had occasional brief attacks of what was called abdominal grip. There were never any definite localizing symptoms.

She was admitted to Worcester City Hospital, January 22, 1931, at 5:30 P.M. This patient was a woman 67 years old, first seen by Dr. Watkins after admission to the hospital and after the x-ray pictures had been taken by Dr. Cook. Admission note states: Patient admitted in very toxic condition such that although she could be roused she did not give accurate replies to questions and at times was delirious. Pulse of fair quality, not rapid; heart sounds distant and indistinct. B. P. 101/86. Abdomen tympanitic, not tense. No visible peristalsis. Patient had been sick at home for one week previous to admission. Had vomited large quantities about once in 24 hours. For several hours previous to vomiting would feel depressed and then was relieved by vomiting. Bowels were moved with enemata but no fecal return for two days previous to admission. Never complained of abdominal pain.

FIG. 2. 3 hr. examination.

She was given a barium meal and was x-rayed by Dr. Cook immediately after admission.

The examination was very difficult owing to the patient's condition. As she lay on the table she was induced to take one glass of barium mixture through a feeding tube, and exposures were begun at once. The findings were as follows: Stomach large with no apparent abnormality. Duodenal bulb presents a crescentic pressure defect on the superior border, and beyond this is a somewhat bizarre deformity in the shape of a ring about 1½ cm. in diameter. The lower duodenum and jejunum

are enormously dilated to a maximum width of 6 cm. The lower portion of the jejunum is covered by barium remnants of an opaque enema, given at home the day before in hopes of eliciting signs of obstruction in that portion of the gut, but which proved negative. This may have prevented discovery of the obstructing stone before operation. The picture was of course that of obstruction of the small intestine. In view of later developments, it is believed that the ring-deformity in the duodenum represented the opening of the cholecystoduodenal fistula. The examination was not carried beyond the first series of observations, for obvious reasons. (Fig. 1.)

FIG. 3. 6 hr. observation.

It was evident from the history and from the x-ray that she had a high intestinal obstruction, but the prognosis appeared pretty hopeless either with or without operation. It seemed, however, that whatever chance she had was from operation which was done that evening. Under local anesthesia a high left rectus incision was made with the intention of doing only a jejunostomy for the purpose of relieving the toxemia. In feeling for the jejunum the fingers encountered a hard mass apparently about 2" in diameter which on being delivered was found to be in the jejunum.

Jejunum clamped on either side of the mass with rubber-covered clamps, a longitudinal incision made in the intestine, a mass delivered and wound in the intestine closed by two rows of sutures. Abdominal wound closed without drainage. The mass proved to be a large gall stone about 5 cm. long by 3½ cm. in diameter, smooth and rounded at one end and faceted at the other. There was a mass of adhesions on the right side in the region of the gall-bladder which was not disturbed. There was no vomiting after the operation but recovery from the toxemia was very slow. Convalescence was complicated by superficial wound sepsis and a bilateral non-suppurating parotitis. She remained in the hospital seven weeks but went home in excellent condition, on March 15.

On June 21 Dr. Watkins was called to see her by the medical attendant. About a week previously, after an unusually hearty meal, she had had abdominal cramps and vomited once or twice. After 24 hours she was entirely recovered. Four days ago she began to have some nausea and occasional vomiting with a dull griping pain in the abdomen. Enemas gave poor results and only temporary relief from the pain and vomiting. At this time she did not seem very sick but it was felt that there was partial intestinal obstruction, possibly from narrowing of the jejunum at the site of suture.

She was sent back to the hospital and the fol-

lowing x-ray findings were made: A flat film of the gall-bladder region is negative. Stomach high with no abnormality shown. Duodenal bulb shows constant and extensive deformity. At three hours (Fig. 2) the stomach has emptied comparatively little and a large coil of dilated jejunum is shown on the left. At six hours (Fig. 3) there is still a large residue

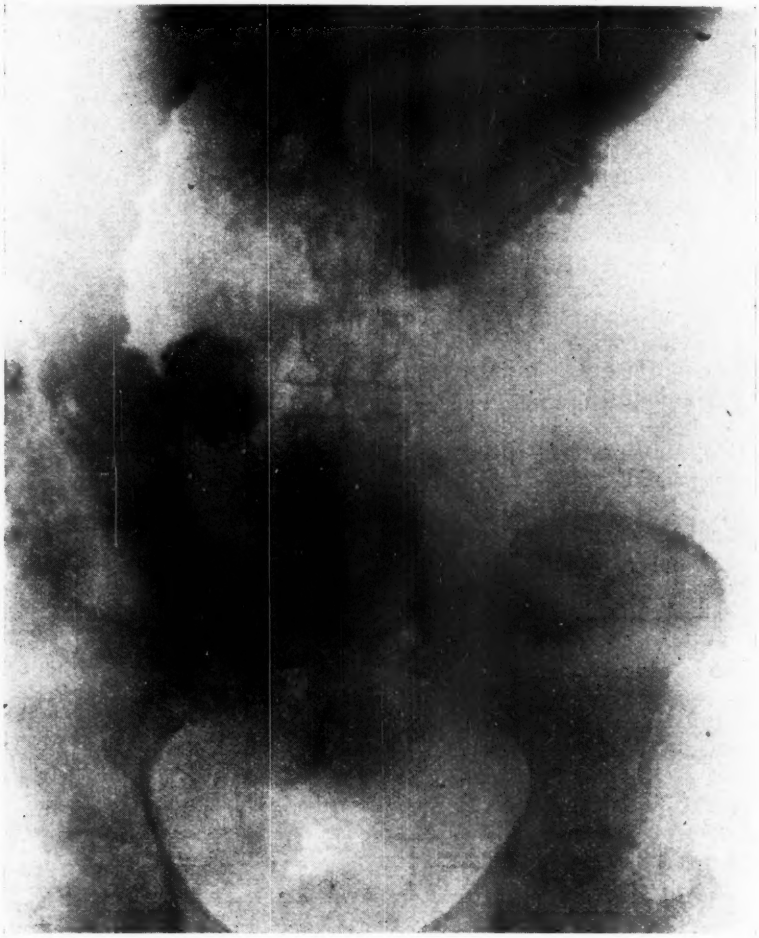


FIG. 4. At 10 hr.

and all of the meal is still on the L. At ten hours (Fig. 4) the cecum has been reached and the ileum is well filled. The lower jejunum shows no dilatation. There is a small amount of gastric residue. This seems to indicate relief of the obstruction in the upper gut.

The patient's clinical symptoms improved markedly between the six and ten hour observations.

After the barium meal the patient had no further symptoms and was discharged on June 29.

On July 1 Dr. Watkins was called by the nurse, who stated that the patient was having a great deal of rectal discomfort with a constant desire to move her bowels but had great difficulty in doing so. Her nurse stated that she could feel something hard in the rectum. Investigation disclosed a gall stone of slightly smaller size but similar in shape to the first one. She was unable to pass this through the sphincter so a few days later it was removed manually under gas anesthesia. Since that time she has been perfectly well.

AMNIOTIC FLUID CONCENTRATE

Postoperative Use To Stimulate Peritoneal Defense and Repair. Report of a Case of Multiple Laparotomies

BY ARTHUR R. KIMPTON, M.D.*

THE case upon which this report is based serves as a severe test of a new procedure in surgical technique and is an excellent check on the claims of the proponents of the use of amniotic fluid, postoperative, in surgery of the serous cavities. In an attempt to evaluate the merits of this innovation, the writer has employed this agent in approximately 400 major operations. Most of this series involves the peritoneal cavity but a small number of joint cases is included. No other single instance, however, has so clearly marked the difference between the treated and untreated cases. While several opportunities have occurred to study the effect of

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this new agent by means of direct observation of the serous surfaces at the time of re-operation, or on the autopsy table, no other similar chance to study the clinical aspects of immediate and remote postoperative recovery in the same individual, with and without the employment of this agent, has presented itself. The striking contrast in favor of the use of this new technique is very impressive. Equally impressive is the persistent recurrence of crippling adhesions following each successive laparotomy where this agent was not employed.

It is claimed by the original investigators that the introduction of Amniotic Fluid Concentrate (Amfetin) into a serous cavity, following a clean surgical procedure, stimulates the normal defense-repair mechanism to the end that the incidence of postoperative infection is markedly lessened. The exciting effect of this agent upon the repair processes results in early resolution, with adhesion formation reduced or absent in at least 80% of the cases. It is further claimed that the formation of protective adhesions in the presence of infection is not prevented.

In the case presented, the patient's difficulty was due to high obstruction resulting from frequent angulation of the gut by dense adhesions. Lysis of these adhesions at previous operations was invariably followed by reformation and extension. The operation deemed necessary to restore the patient to anything approaching a state of health would involve further lysis of adhesions and the breaking down of an anterior gastroenterostomy, a posterior gastroenterostomy and an enteroenterostomy. Extensive contamination of the peritoneal cavity would be anticipated in such a procedure together with tremendous surgical shock. In order to minimize these effects, it was decided to use 500 c.c. of Amfetin, postoperatively. While this dosage was greatly in excess of amounts previously employed, no ill effects were looked for as the substance is practically innoxious.

Immediate and remote postoperative results were very satisfactory. During the first few days following operation, there was evident a mere fraction of the shock one had reason to expect in such a case. The patient's general and local condition stood out in marked contrast to his recovery from previous, less extensive laparotomies where amniotic fluid had not been employed.

Unquestionably the elimination of the jejunal puddle and the restoration of the normal continuity of the alimentary tract together with a complete lysis of all adhesions were the factors responsible for restoring this patient to the excellent physical condition that he now enjoys. However, in the light of his poor recoveries from previous laparotomies, where extensive lysis of adhesions had been performed, and the fact that each succeeding operative venture revealed an ever-increasing extent and density of these crippling adhesions, there is some ground for feeling that a factor was present in this postoperative convalescence that in some manner prevented the reformation of the dense adhesions that followed the earlier operations. Also, when one considers the extent of peritoneal contamination by jejunal contents, in the presence of excessive trauma, and the fact that in the face of such conditions no postoperative peritonitis developed, there is some further basis for feeling that there was present an unusual effort on the part of the peritoneum which did not obtain in previous laparotomies. Singularly significant also is the continued excellent condition of this patient compared with the history of the early recurrence of his distressing condition following previous operations. This observation offers reasonable proof of the failure of adhesions to reform, at least to any extent sufficient to cause the patient even slight discomfort.

It is now a year and four months since this patient was discharged from the hospital and the most recent check upon his condition was made within a week. His hemoglobin is now 104, and his red count 5,580,000. There are no dietary restrictions except those concerning overweight. At the time of operation, the patient weighed 89 pounds. At the present time, his weight is 191 pounds. No symptoms that would even remotely suggest the reformation of adhesions are present.

CASE HISTORY

Father, R. H., a Catholic Priest, 27 years of age, was admitted to the hospital October 12, 1930, with a diagnosis of dehydration and partial high intestinal obstruction.

The C. C. was as follows: nausea, vomiting and upper abdominal pain. F. H.: Negative. P. H.: Patient had always been well until he suffered an attack of appendicitis in 1921 for which he was operated upon at that time. P. I.: In May, 1925, the patient began to have pain in the upper right abdominal quadrant accompanied by nausea, vomiting and jaundice. Operation at that time revealed a gall-bladder buried in dense adhesions. Cholecystectomy with lysis of adhesions was performed. In October of the same year, he was again explored to relieve pain and vomiting which bore a relation to food intake. It was found that the patient had pyloric obstruction with dense adhesion formation. Lysis of adhesions and a posterior gastroenterostomy was performed. Early in 1926, he was again operated upon for relief of pain, nausea and vomiting at which time lysis of adhesions and an enteroenterostomy was performed. Later this same year, he was re-operated upon for lysis of adhesions. All of the foregoing operations took place in another state. In 1927, the patient suffered a recurrence of nausea and vomiting with upper abdominal pain but this condition responded to dietary treatment.

In March, 1930, the patient was operated upon to stop persistent vomiting. Lysis of extensive dense adhesions was performed. In fact, the patient had now arrived at a state where his peritoneal cavity was practically obliterated by massive adhesion formation.

Two months later, May, 1930, he was again operated to relieve continued vomiting. At this time

an anterior gastroenterostomy was performed in an attempt to short-circuit the matted sections of bowel involved in the partial obstruction. Notwithstanding that only six weeks had elapsed since the previous operation there was extensive reformation of adhesions. This amount of time, however, was not sufficient for them to become dense. Following this procedure, the patient had some relief for nine weeks at the end of which time he began to vomit again. Usually this vomiting had no relation to meals, although occasionally it occurred just after eating. Sometimes the vomiting was projectile and, on occasion, the vomitus contained food taken 24 hours previously. There was pain in the upper left quadrant, often severe enough to keep the patient awake at night. This had no relation to his meals.

On October 26, 1930, after two weeks of hospital observation on a modified Sippy diet and frequent recourse to intravenous and subcutaneous therapy, the patient was discharged to his home. Little, if any, relief resulted from this period of observation and treatment, but his general condition was notably improved.

November 5, 1930, ten days after his discharge, he was readmitted for surgical relief. Before returning to the hospital, it was explained to the patient and to his relatives that the operation would be very serious and might well be fatal but they were insistent that it be done.

Operation; November 7, 1930: Lysis of Adhesions. Lysis of Anterior Gastroenterostomy, Lysis of Posterior Gastroenterostomy, Partial Resection of Jejunum with End to End Anastomosis. (Operative procedure followed a definite, preconceived plan of attack.)

On entering the abdomen through a high left rectus incision a very dense mass of adhesions was encountered that practically obliterated the peritoneal cavity. In the lower jejunum, there was a loop of intestine which was markedly dilated. The adhesions around the anterior gastroenterostomy were freed, the junction of the stomach and jejunum was broken down and the stoma in the stomach and jejunum closed. Numerous loops of bowel which were angulated by adhesions were then freed. Adhesions around the pylorus were freed until it was evident that no further obstruction existed. (This was later confirmed by finger exploration through the posterior stoma in the stomach after breaking down the posterior gastroenterostomy.)

The transverse colon was then elevated. Adhesions around the posterior gastroenterostomy were freed. The jejunum, proximal to this anastomosis, was markedly dilated, angulated by adhesions and was quite evidently obstructed. There were many adhesions around the distal loop of jejunum which were also freed. The stomach and jejunum were then separated and the stomach wound closed. There was a short loop of jejunum so badly damaged by the two stomata of the gastroenterostomies and the union of the enteroenterostomy together with the freeing of adhesions that it was resected and an end to end anastomosis done. The intestines were now inspected and freed of all adhesions. All denuded serous surfaces were thoroughly sopped with Amfetin before being replaced in the abdomen. Every effort was made to leave the abdominal cavity as clean as possible. The abdomen was closed in layers without drainage. Through the aperture of the last peritoneal suture 500 c.c. of Amfetin was injected by catheter and syringe. The patient left the table in fair condition following three hours of spinal anesthesia supplemented by N.O.E. 500 c.c. of glucose was given intravenously immediately following operation.

Postoperative Convalescence: Nothing was permitted by mouth for five days. Intravenous glucose was continued once or twice daily. Subpectoral fluid was also given for the first three days. The patient's temperature never exceeded 100.2° F. and at the end of 48 hours remained between normal and 99° F. There was an immediate postoperative pulse rise to 130 which rapidly subsided. At the end of five days, feeding was begun with liquids and bicarbonate water, a few teaspoonfuls at a time. This was gradually increased to three hour feedings of semisolid foods in very small amounts. At the time of his discharge, three weeks following operation, he was able to take small amounts of a very liberal diet including fish, chicken, lamb chops and other fresh meats.

On about the tenth day, postoperative, the abdominal wound broke open at the lower pole down to but not including the fascia. It was almost entirely healed at the time of discharge. During his convalescence, he vomited but once and that following the anesthesia. At the time of discharge, November 26, 1930, the patient had been out of bed four days. He was still anemic; hemoglobin about 50, but this condition was rapidly improving under treatment.

COMMENT

This brief summary of the facts concerning this case are offered as a contribution toward an early evaluation of this new therapy.

INDUSTRIAL MEDICINE

Industrial medicine is a natural development of this industrial age. In its train have come the various forms of contract practice, health and compensation insurance, with the different types of collective medical service. In this issue* appears the last paper of the interesting symposium on the various phases of this problem presented at the Annual Congress last February.

Contract practice is recognized as illegal, as economically unsound, highly commercialized and competitive, yet essentially it is an economic issue, originating largely from necessity, that must be dealt with because it has become a countrywide situation.

As brought out in one of the earlier articles, industrial medicine has its development in the past twenty-one years and is now in process of rapid change. Legislative acts that created industrial liability laws have forced the American manufacturer to enter the practice of medicine whether legally or illegally.

As pointed out by McCord, the fundamental evils of industrial medicine as practiced center about the lack of qualifications of the physician in charge. The general hostility of the medical profession toward industrial medicine is another deterring factor in keeping many good physicians from electing this as a specialty. On the other hand, industrial medicine conducted along proper lines offers unusual opportunities for medical service to the worker and the public good, besides enhancing the economic status of the physician. It has become a distinct part of a rapidly advancing social order, and the medical profession should exert every effort to keep it under its control. Aside from its economic aspects it deserves recognition as one of the most important forms of specialized medical practice.—

**Federation Bulletin*, August, 1932.

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 18361

HYPERTENSION AND PRECORDIAL PAIN

MEDICAL DEPARTMENT

PRESENTATION OF CASE

DR. DWIGHT L. SISCOE: This is the case of a patient I saw first in February, 1930, at which time she was sixty-two years of age.

She had been a very hard working woman. She had a dressmaking establishment, lived in it and worked constantly. Her blood pressure was 182/116. She was having dyspnea and palpitation on exertion. She had no anginal pain and no decompensation at that time. There was a loud systolic murmur in the third left interspace. She was overweight, 167½ pounds, her normal weight being 145. I thought at that time that she had hypertensive heart disease with moderate enlargement of the heart. The left border was 12 centimeters out, the right border 2.5 centimeters. The supracardiac dullness was 5.5 centimeters. I tried to have her lose weight.

I saw her a month later, at which time she had lost 15 pounds. Her blood pressure was then 172/100. She had been having a little precordial pain associated with a great deal of gas and epigastric discomfort, so much so that I thought it might be gall bladder disease, though I did not think so strongly enough to have x-ray observations made.

I saw her again a month later, in April, 1930. She weighed 145 pounds. Her blood pressure was 210/110. She was slightly cyanotic and still had persistent precordial pain, especially on exertion.

I saw her again in May, 1930. Her weight was still 145 and her blood pressure 184/110. She was still having a great deal of gas, precordial pain and at times asthma on exertion.

I saw her next in September, 1930, at which time she weighed 147 pounds and her blood pressure was 208/110. She had gas, a little substernal pain and some dyspnea. There was still some suggestion of gall bladder disease but it seemed to me to be all cardiac rather than gall bladder. I wanted her to come into the hospital then to make more careful observations, but she did not do so and dropped out of sight.

I did not see her again until immediately before the present admission, which was June 13, 1932. I found her very cyanotic, with markedly severe precordial pain radiating to the shoulders and down both arms. The skin was quite cold and mottled. She was having chills and was obviously slipping into collapse. Her temperature was 98.6°, her pulse 80. There was only an occasional extrasystole. The blood pressure was 180/120. I could hear no friction rubs at that time. The systolic murmur was about as it had been. There was no edema and no extensive congestive failure. I thought that she was having slow coronary infarction with thrombosis, and on account of her living conditions had her moved into the Baker Memorial Hospital.

During the next twelve hours at the Baker her systolic blood pressure dropped from 190/110 when she entered to 0, at which time she was in definite collapse, quite blue, mottled and looking as though termination was imminent at any moment. At that time we noted weakness of the left arm which increased during the next twenty-four or thirty-six hours to flaccid paralysis. It seemed to me that she had definite coronary thrombosis with probable cerebral thrombosis. I thought it was thrombosis on account of the steady and gradual increase in paralysis. Death occurred two days after her admission to the hospital.

DR. TRACY B. MALLORY: How many days after the onset of the precordial pain was that?

DR. SISCOE: About two weeks. I saw her first three days before her death, although she had then been having, she told me, increased precordial pain, dyspnea and obvious cardiac difficulty for ten days.

DR. J. H. MEANS: Will you tell us about the temperature after entry and also the white blood count?

DR. SISCOE: The temperature on admission was 97.6°. The next morning it was 101°. It continued to rise until it reached 103°. The pulse rate was 80 on admission and steadily increased to 130. The respirations were 20 and increased to 30 on the day of death. There was only one white blood count made, on the fourteenth; that was 19,900. The red blood count was 5,090,000. The differential count showed 85 per cent polynuclears. There is no urine report. The non-protein nitrogen on admission was 43 milligrams per 100 cubic centimeters of blood.

DR. ARLIE V. BOCK: Did the blood pressure stay at 190 during her stay in the hospital?

DR. SISCOE: The blood pressure on the evening of admission was 190/110. At that time the heart was slightly enlarged to the left. There was an occasional missed beat. The sounds were of fair quality. There was a loud systolic murmur, best heard at the aortic area. No diastolic murmur was heard and no pericardial friction rub. The lips were cyanotic and there was pal-

lor and mottled blueness of the skin of the arms. The liver was not enlarged. There was no edema. There was good pulsation of the dorsalis pedis. The following morning her blood pressure could not be obtained by the house officer or myself.

DR. BOCK: Did it stay like that?

DR. SISCOE: It came up to 110 systolic on the fifteenth, but I could not get the diastolic at all. The pulse and respirations were going up steadily.

DR. FREDERICK T. LORD: I do not understand whether or not the precordial pain was continuous.

DR. SISCOE: There is no statement that she was in pain during the first night in the hospital. She was given morphine and later was found in collapse, semiconscious. She was not able to complain. We did not see any great clinical evidence of severe pain, but we do not know.

CLINICAL DIAGNOSES (FROM HOSPITAL RECORD)

Essential hypertension.
Cerebral hemorrhage.

DR. DWIGHT L. SISCOE'S DIAGNOSES

Hypertension, arteriosclerotic.
Coronary thrombosis.
Cerebral thrombosis.

ANATOMIC DIAGNOSES

Cardiac infarction with rupture of the left ventricle and hemorrhage into the pericardium.
Cerebral infarct.
Edema of the lungs.

PATHOLOGIC DISCUSSION

DR. MALLORY: I should not think one could get any further with a clinical diagnosis on the case than coronary thrombosis. It did show a little more than that at autopsy. When we opened the pericardium it contained somewhat more than 300 cubic centimeters of bright red fresh blood. There was an actual rupture of the heart. An infarct had occurred close to the apex of the left ventricle. A small thrombus had formed over that and had also extended through the wall. There was a little thrombus beneath the epicardium and there was an obvious small perforation through which a thin probe could be passed from the endocardium through to the pericardial cavity. Thrombosis was found in the left descending branch of the left coronary in exactly the spot where they are most often found, apparently a quite fresh thrombosis with some older atheromatous thickening in the artery. Arteriosclerosis was also present in marked degree in the cerebral vessels with another point of thrombosis and a localized patch of softening in the right prerolandic area of the cortex.

Otherwise the findings at autopsy were essentially negative. There was a fairly marked congestive edema of the lungs; no evidence of respiratory infection however. The liver showed only a moderate degree of passive congestion. It was not particularly enlarged. The gall bladder was entirely negative.

DR. LORD: Among the causes of sudden and unexpected death in the hospital experience, cardiac failure is second in frequency to pulmonary embolism. There have been about a dozen instances of painless coronary occlusion with postmortem examination, and in this group the clinical picture is much like that with pulmonary embolism.

DR. MEANS: Dr. Mallory, how many cases of actual rupture of the heart do you know of in which there has been such an interval between the first symptoms and death?

DR. MALLORY: I have not seen many cases. In the case I remember best, that of Mr. X, several days elapsed. Dr. Sprague, who attended him, can tell us more exactly.

DR. HOWARD B. SPRAGUE: In that case coronary thrombosis probably occurred four days before rupture of the heart. Cerebral embolus occurred on the fifth day and death five hours later. Therefore it was probably twenty-four hours after the heart was ruptured that death occurred.

DR. MEANS: Do you suppose this rupture began when she first went into collapse? Or was it a terminal event before death, the first collapse being merely the picture of acute coronary occlusion?

DR. MALLORY: I should imagine that the hemorrhage had not been present a very long time from the fact that the blood was entirely unclotted in the pericardium. In the case of Mr. X we have reason to think there was an interval between rupture and death, and there was definite clotting, whereas there is none here. Of course the clotting time varies enormously depending on chemical factors such as cyanosis, etc. I cannot make any exact estimates, but I should certainly think if rupture occurred forty-eight or seventy-two hours before death we should have had evidence of clotting.

A PHYSICIAN: Did she not have more fever than we ordinarily expect?

DR. MALLORY: I think we quite frequently see as much as that. Those final temperatures were rectal.

DR. SISCOE: Was there any pathologic evidence of extension of that thrombosis area which would account for her collapse the night of admission to the hospital? If not, that sudden collapse with a drop of blood pressure had practically nothing to do with a rupture that occurred thirty-six hours before she died.

DR. MALLORY: I do not think we can esti-

mate the age of a thrombus with sufficient accuracy to tell that. We can tell the difference between one two or three days old and one five or six weeks old, but it is difficult to estimate them much more closely than that.

Dr. Edward D. Churchill: Are there any data available in regard to increase in the venous pressure in these cases? Coronary thrombosis with rupture of the heart and a hemopericardium as in this case would undoubtedly cause increased venous pressure. Pulmonary embolism commonly produces it. I should like to know whether uncomplicated cardiac thrombosis is commonly associated with a rise in venous pressure.

Dr. Sprague: Thrombosis involving the right side of the heart produces evidence of rapid increase in venous pressure.

What is the shortest time after coronary thrombosis that rupture of the heart can occur? Figures taken from coroners' statistics with observations of sudden death from rupture of the heart show rupture to be a delayed affair following healed coronary thrombosis with thinning and a tendency toward cardiac aneurysm. Acute coronary thrombosis which drops a man in the street cannot be associated with cardiac rupture.

Dr. Mallory: I would agree with that. After thrombosis occurs it takes a sensible period of time, I should think probably nearly forty-eight hours, before enough myomalacia occurs to permit rupture. With extreme hypertension it might possibly occur.

Dr. William D. Smith: When that woman went into collapse did you notice a change in the area of cardiac dullness, so that we might assume that a pericardial effusion of 300 cubic centimeters could be observed clinically?

Dr. Siscoe: No, I did not. The collapse apparently occurred during the night. The following morning I noted no evidence of change in the cardiac dullness.

Dr. Mallory: A clinician would be pretty lucky if he could pick out a case of pericardial effusion of 300 cubic centimeters. I should say that very seldom less than 500 cubic centimeters gives clinical evidence.

Dr. Churchill: 300 cubic centimeters would be pretty apparent physiologically if it were due to a sudden hemorrhage.

Dr. Mallory: Provided it occurred suddenly. Accumulating slowly I do not think it would give the slightest evidence.

Dr. Aubrey O. Hampton: Some years ago Dr. Holmes showed that the pericardium would hold 250 cubic centimeters without rupture and without showing any increase in size, at least by x-ray.

CASE 18362

SEVERE SUBSTERNAL PAIN OCCURRING WHILE THE PATIENT WAS UNDER OBSERVATION

Medical Department

Presentation of Case

Dr. Alfred Kranes*: This is the case of a forty-five year old married American silversmith who was brought over to the Emergency Ward from the Cardiac Laboratory, where he had come for examination.

The story went back two years. It started with rather mild substernal pressure and oppression every time he exerted himself. There was no radiation, but once in a while he had some substernal pressure which would last two or three minutes and would be immediately relieved by slowing his pace a little. The first summer he had it only infrequently, but during the following winter and the subsequent year these oppressive feelings became more and more severe and frequent. On two occasions, once eight months and once a week before entry, he had rather sharp attacks of substernal oppression, the first one lasting five or ten minutes and the second one about the same time. With each one he had definitely to sit down and rest fifteen minutes before he could get any real relief. The attack a week before admission frightened him somewhat, so that he went to see a doctor for the first time. The patient's father died of "acute indigestion", and the patient thought he also might have angina pectoris. The doctor asked him to come here for an electrocardiogram. On the way to the laboratory he had an attack.

He was rather frightened when he came in, but when the electrocardiogram was taken at the Cardiac Laboratory he appeared to be well enough. Then the physician took a blood Wassermann. He was putting the blood into the syringe when the patient collapsed on the floor, became nauseated and began to have midepigastric distress and later a mild precordial pain radiating to the arm. He was immediately brought to the Emergency Ward.

When he was seen there he was lying on the shock table tossing from side to side, very pale, sweating moderately and looking very frightened. The pulse could just be felt, very rapid and weak. The respirations seemed to be very labored. He could not seem to get enough air. The heart did not seem to be particularly enlarged. The sounds were not of very poor quality; they were pretty fair. The rate was very rapid. There were no murmurs. No friction rub could be heard. The rhythm was perfectly regular. The blood pressure at that time was 130/70. He was given nitroglycerin, 2/100

*Recently senior interne on the West Medical service.

of a grain; then he was given a quarter grain of morphia without relief of the pain. He was given three quarters of a grain of morphia within two hours, yet the pain persisted during the course of the afternoon. He was brought over at half past ten o'clock in the morning. The electrocardiogram was obtained at about eleven.

Dr. McGinn took a series of electrocardiograms on this patient. In view of the fact that the first one was taken before the attack they are rather interesting.

When the patient was brought to the ward he continued to have much pain and required a good deal of morphia before he could get even moderate relief. He never got complete relief in spite of very large doses of morphia. The blood pressure remained at 130 during that day, but during the evening and the next day it gradually fell. At times it could not be obtained at all. We thought that most of the time the systolic was 80 or 70, the diastolic 60, the pulse pressure always being very small.

The temperature on admission was normal. It gradually rose to 101.5°.

The white cell count on admission, taken only a short time after the attack of pain, was 21,000. The differential showed 91 per cent polynuclears. The following day the white cell count rose to 32,000.

He began to cough the day after admission and raised a moderate amount of very frothy blood-tinged sputum. Râles appeared at both bases. He was digitalized, not very rapidly, but he continued to fail. The blood pressure fell. The chest filled up more and more with fluid. Three days after admission he died, apparently from congestive heart failure.

Clinical Discussion

Dr. Edward F. Bland: I have his electrocardiographic records, four taken during the course of two days in the hospital. The first one I believe was taken about half an hour before the attack. In spite of the fact that he had angina pectoris it showed nothing remarkable or suggestive of heart disease except a flat T_1.

The next one, taken one hour after the coronary thrombosis, showed definite supportive evidence of such an occurrence, namely a typical high takeoff of T_1. It is of considerable interest that this change had taken place so quickly after the thrombosis.

During the rest of his stay in the hospital there were progressive changes from day to day. An electrocardiogram taken later during the first day showed progressive changes in the T_1 and one taken the next day showed bundle branch block. So in the course of two days we found unmistakable evidence by electrocardiogram of recent coronary thrombosis.

Dr. Howard B. Sprague: I saw this patient once, the day before he died, when he apparently had passed the acute stage. The thing that was impressive was the great amount of evidence of the size of the cardiac infarction as shown by the temperature and the white cell count. There were very poor heart sounds, a very low blood pressure and evidence of congestive failure. There were so many factors against him that in spite of the fact of his weathering the first acute episode I did not believe that he would recover.

A Physician: I should like to ask what the consensus of opinion is as to the dosage of morphia. This man was in severe pain and had three quarters of a grain of morphia in three hours without stopping the pain. Would it not be reasonable in a case like this to give morphia to the point of stopping the pain, irrespective of the amount?

Dr. Kranes: It was given. The respirations went down so low several times that we could not give more.

A Physician: He had three quarters of a grain of morphia in three hours' time. I should not call that much dosage, and he was still having pain.

Dr. Gerald Blake: I think that Dr. Kranes is right. I think we have to have something as a test of the quieting and the toxic effect of morphia. Dangerously slow respirations may be as good a test as any. In the terminal occlusions which appear as if they are going to last only a few hours I think the only way is to give something else, like chloroform in small doses.

A Physician: Chloroform was not given in this case?

Dr. Blake: No; but I do not think this man's pain was at its greatest severity with three quarters of a grain of morphia. It was not obvious that he was going to die in an hour or two.

Dr. Edward D. Churchill: I should think pain like this could be relieved by novocain injection. Would not novocain given over the precordium have some effect?

Dr. Kranes: After the first two or three hours the pain was very mild.

A Physician: If one is loath to give a dosage of morphia that will relieve the pain, then try these other methods and make the patient as comfortable as possible. I do not see anything to be gained by allowing these patients to have pain. In France we used to give much larger doses of morphia.

Clinical diagnosis (from hospital record)

Coronary thrombosis.

Anatomic diagnoses

Thrombosis of the left coronary, anterior descending branch.
Infarction of the heart.
Mural thrombosis of the left ventricle.

Acute fibrinous pericarditis.
Slight cardiac hypertrophy and dilatation.
Slight aortic and renal, marked coronary arteriosclerosis.
Pulmonary congestion and edema.
Healed apical tuberculosis.

Pathologic Discussion

Dr. Tracy B. Mallory: Autopsy here showed typical coronary thrombosis. The actual area of thrombosis was somewhat larger than in Case 18361 in that both branches of the left coronary were completely blocked by thrombosis. There was an infarct involving the entire anterior apical portion of the left ventricle. The wall was definitely soft on palpation. I think that is of some interest in connection with the point Dr. Sprague brought up in the last case as to how rapidly myomalacia occurs. Death occurred forty-eight hours after the thrombosis, which we can date very accurately in this case.

This first section is from the coronary artery. It shows the very marked thickening of the walls and atheromatous deposits. Those slit-like gaps represent cholesterin crystals surrounded by polynuclears. There is slight polynuclear infiltration at an edge of the thrombus, probably the beginning stage of organization.

A section of the myocardium through the point of infarction shows obvious complete necrosis of all the muscle fibers. They have lost their nuclei and their striations and are becoming hyalinized. The entire area is infiltrated with polynuclear leukocytes. At forty-eight hours after the period of infarction this heart has reached the point at which it very easily could rupture. In cases of immediate death from coronary thrombosis one ordinarily finds no morphologic evidence of necrosis of muscle fibers, since only a few minutes intervene between the death of these fibers and death of the remaining cells in the heart. In about six to twelve hours one begins to get unmistakable signs of reaction, and when one gets to a stage such as this, at about forty-eight hours, one gets a tremendous reaction, with an increased white cell count and a very high percentage of polynuclears. Exactly where that period in which we can detect gross softening comes I do not know. We do not see many cases in that interval. Most of our cases here have immediate death or death three to ten days after the infarction.

There is one other point of interest in these cases. That question is, how soon after the occurrence of thrombus formation can one get a cerebral embolus? I do not know the time interval for that, but theoretically embolus is possible as soon as a thrombus forms from which it may arise. This patient had a definite thrombus forming inside of forty-eight hours from which an embolus might have broken off. Again I do not know the exact time. I should think it was not much less than twenty-four hours and it is more likely to be forty-eight. On the whole, however, it has not been a very common coincidence in our coronary cases.

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THE CIGARETTE HABIT

J. D. ROLLESTON, M.A., M.D., F.R.C.P., F.S.A., in addressing the British Society for the Study of Inebriety on this topic last spring suggested "that the chief reason that the subject has received so little attention from members of the medical profession is that the majority of them as of the general community practice smoking in one form or another, and do not wish to inquire too closely into a habit in defence of which so much can be said from the hedonistic but so little from the hygienic standpoint".

Impartial scientific investigations into the effects of the use of tobacco have been comparatively few in number, and of the investigations which have been made many are scientifically unreliable because of the controversial nature of the subject. The world is divided into two camps—the smokers and the non-smokers, and curiously enough the non-smokers seem to be as militant in proselyting their attitude as the smokers are in defence of their habit.

Dr. Rolleston, a smoker for thirty years and a non-smoker for ten, has attempted to make an unbiased evaluation of our present knowledge of the subject, bringing up to date the Norman Kerr Lecture on the tobacco habit, delivered by the late Professor W. E. Dixon in 1927.

Cigarette smoking, in view of our imperfect knowledge of its effects, has become an addiction which must be reckoned with, for its increase has become tremendous in the years since the war. In the United States, for instance, the number of cigarettes produced has increased from 2,971,000,000 in 1902 to 123,000,000,000 in 1930—an output equivalent to the annual consumption of more than a thousand for each man, woman and child in the country. These cost the people $922,500,000—a sum sufficient to build two and a half Panama Canals.

The smoke of cigarettes contains only about half the percentage of nicotine contained in that of cigars or pipes. It does, however, contain a relatively large quantity of carbon monoxide. Other toxic substances are pyridine and furfural.

Many of the ill effects attributed to cigarette smoking can be discounted as unproved or disproved; there are, however, certain effects which can be sufficiently well demonstrated. Its effects on the digestive tract are loss of appetite, gastric hypermotility and hyperchlorhydria, and it is coming to be regarded as an important factor in the causation of duodenal ulcer. It increases the pulse rate and causes palpitation, various forms of arrhythmia and a rise of blood pressure. Two cases of sino-auricular block due to tobacco have been noted. The nervous system is undoubtedly affected, at least functionally, conjunctivitis has been attributed to pyridine, and amblyopia due to retrobulbar neuritis most certainly occurs. A relationship of cigarette smoking to cancer has not been definitely established.

Cigarettes are going to continue to be smoked, but that is no reason why we should close our eyes to their physiological effects. It is doubtful if many smokers will adhere to the rules finally quoted:

1. Don't smoke until after the age of 21.
2. Don't smoke more than five cigarettes daily.
3. Don't inhale or blow through the nose.
4. Smoke out-of-doors and not indoors.
5. Always use a cigarette holder.
6. Smoke only immediately after meals.
7. At least once a year stop smoking for a month or more.
8. Have a health examination periodically.

THE PENALTY OF IGNORANCE

EIGHTEEN persons in New York City have died recently after drinking poisoned alcohol. The symptoms exhibited by these victims have

been blindness and also pain in the epigastrium which often follow the ingestion of methyl alcohol.

The very considerable publicity which has been given to the dangers of drinking denatured alcohol seems to be insufficient as a deterrent of the use of this mixture. Presumably none of these victims would have knowingly taken this liquor and, since there have been so many cases of this cause of death, it seems reasonable to expect that this method of denaturing alcohol should be abolished.

So long as the human animal desires the effect of alcoholic beverages, he should, although ignorant, be protected from this menace to life.

It is not logical to say that the victim himself is to blame, for, if this statement absolves authorities of responsibility, it might be carried to unreasonable extremes. Preventive medicine strives to eliminate all causes of death and even the intemperate are often of some value to society. The use of alcohol in one form or another is customary with many, even though it may not be sanctioned by law in this country, and contributory ignorance or folly is a public health problem which includes a wide range of subjects. If the ingestion of methyl alcohol can be prevented by forbidding its mixture with grain alcohol, that is worthy of consideration.

Considerable effort was made a few years ago to discover and eliminate the poison ingestion of a harmful ingredient of the extract of Jamaica ginger which was taken as a beverage. Why not carry the prevention farther?

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

BUTLER, P. F. M.D. Harvard University Medical School 1903. Director, Radiological Laboratories, Boston City Hospital. Assistant Professor of Roentgenology, Harvard Medical School. Address: 35 Bay State Road, Boston. Associated with him is

RITVO, MAX. A.B., M.D. Harvard University Medical School 1924. Visiting Roentgenologist, Boston City Hospital. Instructor in Roentgenology, Harvard and Tufts College Medical Schools. Address: 485 Commonwealth Avenue, Boston. Their subject is "Primary Carcinoma of the Lung." Page 435.

LEVENE, GEORGE. M.D. Boston University School of Medicine 1925. First Assistant Roentgenologist, Massachusetts Memorial Hospitals. Associate Member, Evans Memorial for Clinical Research and Preventive Medicine. Instructor in Roentgenology, Boston University School of Medicine. His subject is "Roentgenologic Diagnosis of Gall-Bladder Disease." Page 443. Address: 351 Winter Street, Norwood, Mass.

WYETH, GEORGE A. M.D. University of Pennsylvania 1903. Consulting Surgeon, Grasslands and Bronx Maternity Hospitals. Formerly Assistant Surgeon at Polyclinic Hospital. Author of "Surgery of Neoplastic Diseases By Electrothermic Methods." His subject is "The Treatment of Growths by Electrosurgery." Page 450. Address: 667 Madison Avenue, New York City.

THOMPSON, CHARLES E. M.D. Harvard University Medical School 1902. Superintendent, Gardner State Colony. Address: Gardner State Colony, East Gardner, Mass. Associated with him is

MARSHALL, HAROLD K. M.D. Harvard University Medical School 1904. Assistant Physician, Gardner State Colony, Department of Mental Diseases. Address: Gardner State Colony, East Gardner, Mass. Their subject is "Colon Irrigation in the Treatment of Mental Disease." Page 454.

KRUSEN, FRANK HAMMOND. M.D. Jefferson Medical College 1921. Director, Department of Physical Medicine, Temple University Medical School. His subject is "Physical Therapy: An Aid to Routine Medical and Surgical Practice." Page 458. Address: Temple University Medical School, Philadelphia, Pennsylvania.

COOK, PHILIP H. A.B., M.D. Harvard University Medical School 1903. Roentgenologist, Worcester City, Hahnemann and Worcester Memorial Hospitals. Consultant, Worcester State and Fairlawn Hospitals. Address: 27 Elm Street, Worcester, Mass. Associated with him is

WATKINS, ROYAL P. A.B., M.D. Columbia University College of Physicians and Surgeons 1892. F.A.C.S. Consulting Surgeon, Worcester City Hospital. Surgeon-in-Chief, Fairlawn Hospital, Worcester. Address: 332 Main Street, Worcester, Mass. Their subject is "Recurring Intestinal Obstruction by Gall Stone." Page 462.

KIMPTON, A. R. M.D. Dartmouth College Medical School 1905. F.A.C.S. Surgeon-in-Chief, Fourth Surgical Service, Boston City Hospital. Consulting Surgeon, Newton Hospital, New England Hospital for Women and Children, Somerville Hospital and Sturdy Memorial Hospital, Attleboro. His subject is "Amniotic Fluid Concentrate: Postoperative Use to Stimulate Peritoneal Defense and Repair." Page 465. Address: 23 Bay State Road, Boston.

MISCELLANY

A RADIO MESSAGE PREPARED AND SPONSORED BY THE COMMITTEE ON PUBLIC EDUCATION OF THE MASSACHUSETTS MEDICAL SOCIETY FOR THE DEPARTMENT OF PUBLIC HEALTH

The Deaf Child*

BY HARRY P. CAHILL, M.D.

The sense of hearing is next in importance to the sense of sight, yet one child in every ten shows some loss of hearing and one in every hundred shows a serious loss. Any serious defect of hearing is a grave handicap. It forces the pupil to repeat his grades. The child then becomes discouraged and various psychoses and much mental suffering result.

Considerable loss of hearing may take place before the child enters the ranks of the deaf. In fact, loss of hearing usually amounts to nearly fifty per cent before even the intelligent parent considers it of importance enough to consult a physician unless the defect is discovered in the school tests.

Any child not making proper headway in the district school must be examined as to his hearing, for the presence of a deaf child, outside of his proper sphere is a detriment to the normal hearing class and a rank injustice to himself. If he can make proper advancement in the district school, we want him there. In many cases a short term of special training in lip reading under proper teachers is sufficient to enable the deaf child to do this. The progressively deaf, especially, should learn lip reading.

WHAT DOES ONE MEAN BY PROGRESSIVE DEAFNESS?

Progressive deafness may embrace any type of increasing defective hearing. Ordinarily, we divide it into two groups; middle ear or conduction deafness and internal ear or perception deafness. Infection is the common cause of middle ear deafness. The infection may be so mild that there is merely increased secretion of serum or mucus but not of pus into the middle ear cavity. It is then termed "catarrh of the middle ear". At times the germ present is more deadly (virulent) and pus is formed which discharges through a perforation in the drum membrane. This purulent inflammation of the middle ear is much more serious and may be complicated by mastoid involvement. Any ear discharging over a long period of time usually means a serious chronic infection of the middle ear. Not only is hearing affected but the infection may spread beyond the middle ear and mastoid, or involve the brain or invade the blood-stream. This is the reason why the insurance examiner is so particular about a prospective client's ear condition. What is of importance to the insurance companies surely should be of vital importance to the owner of a discharging (running) ear. For every discharging ear of an innocent nature, there are scores of a serious type. Everyone with a discharging ear should discuss his condition with a physician. He may be carrying a lighted bomb in his head. If the discharging ear is of long standing, he should not allow water to enter the ear canal. He should not irrigate his ear; he should not go in swimming.

SWIMMING

Swimming is a great sport, but it plays havoc with the ear. Fresh water bathing is liable to produce sinus infection. It has reinfected innumerable quiet middle ears.

Water irritates the middle ear and water can reach the middle ear cavity in two ways. It can enter through a perforated ear drum or along the ventilating tube connecting the middle ear with the rear chamber of the nose. How can we prevent water reaching the middle ear? Ear plugs are of a little help. Refraining from diving is of some value. Care in permitting the nose to drain after swimming rather than attempting "to blow the ocean out of it" is of great importance, but the boy or girl with any serious ear trouble would do well to keep out of the water.

Fresh water swimming is far more dangerous than salt water swimming. Fresh water is more easily contaminated; it does not purify itself so readily; it is far more irritating to the mucous membranes of the nose and sinuses. Fresh water swimming can both irritate and infect the mucous membranes of the nose and ear.

Proper precautions can greatly reduce its dangers, however.

1. No person with a cold should go in swimming. He is then a menace to himself and to his companions.
2. No person with a history of serious sinus or ear disease should go in swimming.
3. The amount and time of swimming should be regulated carefully so as to avoid chilliness and fatigue.
4. Draining rather than blowing the nose after swimming is very vital.

DEAF MUTISM

Speech is one of the marks distinguishing man from the lower animals. This speech is dependent upon hearing for its birth. The so-called "deaf mute" is a clear example of this. Speech is acquired by imitation of sounds heard—hence, when a child is born deaf or becomes *so* deaf at an early age that he does not hear the voice distinctly, he never learns the language and is dumb. (The term deaf mute implies that the individual cannot hear and hence cannot speak.) He may hear loud sounds or high notes; he may feel the vibrations of stamping on the floor; this is not sufficient. He must hear the human voice well enough to imitate it. The deaf mutes, who number about one in every 2000 amounting to nearly 45,000 in the United States, are of two types: those born deaf, and those becoming very (completely) deaf before the age of three years.

*Broadcast: May 17, 1932. Time: 4:20 P.M. Place: Hotel Bradford.

The commonest cause of the acquired type of deaf mutism is cerebrospinal fever, scarlet fever, mumps and measles. Any discharging middle ear giving rise to severe deafness in both ears in a very young child may lead to deaf mutism.

Our Massachusetts schools for these children rank among the best in the land. Here lip reading, articulate speech, and acoustic reëducation is carried out to the highest degree.

AIDS TO HEARING

The hard of hearing (deaf) are deluged with masses of literature and advice on cures for deafness. Ninety per cent of these cures approach pure quackery and the remainder may be absolutely unfit for the particular case.

These aids to hearing group into three classes: the mechanical devices, marvelous curative solutions, and special methods of treatment.

The hearing devices range from artificial eardrums to elaborate electrical contrivances. The artificial eardrum is of value only in cases of partial loss of the normal drum membrane without discharge. The dangers of infection connected with its use are many. The patient should always be under the care of an experienced adviser. The composition of these drums varies from sterile cotton balls, and paper patches, to oiled silk discs, rubber nipples and collodion cylinders. They are valueless in catarrhal deafness and in most of the other types.

The ear trumpet and speaking tube are of aid in all types of hard of hearing whether middle ear disease or nerve deafness. Their bulk and appearance naturally prevent their more general use.

The electrical devices are many. There are at least a dozen standard types on the market. The catarrhal deaf, with increased bone conduction and ability to hear better in noisy places, seem to profit much more by their use than the patient with pure nerve deafness. These phones are constantly being improved. They should be purchased only through a standard house. Some may be rented for a month with an option. Mail order devices are usually worthless.

The curative preparations are either antiseptic solutions to stop the discharge from the middle ear or quack solutions of which there are many.

An antiseptic solution such as boric alcohol mixture and others are of value in drying up a chronic discharging ear, but no oil even of the most savage rattlesnake will help catarrhal deafness by merely dropping it into the ear canal.

Special methods of treatment embrace courses in manipulation, x-raying of the pituitary gland and various types of oscillators and noise producing apparatus. Many of these types of treatment are useless.

The value of removing adenoid adhesions about the mouth of the eustachian tube (the ventilating tube connecting the middle ear with the back of the nose), has been used for years since Dr. William Meyer of Copenhagen, over fifty years ago, first removed adenoid tissue. Before one travels over two hundred miles and spends two hundred or more dollars for such a course of treatment, it would be safer to visit the clinic at the Massachusetts Eye and Ear Infirmary, or any recognized hospital clinic. There, reconstruction of the eustachian tube, if it can be called such, will be given without elaborate preparation, and without gas-ether anesthesia. The case must be examined first to see if any benefit is possible with such treatment.

X-ray treatment may aid in the absorption of diseased lymphoid (tonsillar) tissue in the throat and along the eustachian tube, but x-raying of the pituitary gland is of no value.

The greatest preventive of deafness has been and is the removal of diseased tonsils and adenoids.

LIP READING

When an incurable impairment of hearing interferes with an individual's routine of life, lip reading should be considered. The deafened man or woman is often extremely lonely. Such advice should be given kindly and with sympathy. No hard of hearing patient is quite so deaf as the tests indicate (or as he appears to be) unless total hearing is lost. This latent hearing can be utilized. Instruction in lip reading will accomplish this and lift the individual out of his desperate loneliness. It will awaken in him hearing which he never dreamed he possessed. It will convince him that he has a definite place in society and must not ostracize himself. The importance of lip reading by the hard of hearing has been greatly neglected. Many of the deaf acquire it without much effort. All are benefited by it. Lip reading calls into action whatever hearing is present. Hence, it is a stimulant to the hearing organ rather than a depressant. It should be undertaken before the patient becomes too deaf. Much can be accomplished at the home.

Instruction in lip reading is given in our evening schools. Personal private courses may be obtained at a very low cost. Massachusetts teachers are among the best in the world, yet few avail themselves of this opportunity. The deaf person should join the Hard of Hearing Guild. There is one in every large city. There he will find assistance and sympathy not obtainable elsewhere. Nearly one-half of the "hard of hearing" are forced to change their occupations. Often this new field brings them success never possible in their former positions. Many who are hard of hearing unconsciously acquire the habit of lip reading. Instruction and practice will greatly increase their ability.

A LETTER FROM A SUBSCRIBER

I subscribe to a number of medical journals but I value yours as highly as any of them although the cost of some is twice as high as is yours. (This is not to be construed as advice to raise your subscription rate.)

E. G. F.

COMPARISON OF DISEASE INCIDENCE IN CONNECTICUT WITH 1931 AND SEVEN YEAR AVERAGE

MONTH ENDING AUGUST 20, 1932

Diseases	1932 Week ending July 30	1932 Week ending Aug. 6	1932 Week ending Aug. 13	1932 Week ending Aug. 20	Average cases reported for week corresponding to Aug. 20 for past seven years	1931 Week ending Aug. 1	1931 Week ending Aug. 8	1931 Week ending Aug. 15	1931 Week ending Aug. 22
Actinomycosis	—	—	1	1	—	—	—	—	—
Cerebrospinal Men.	—	1	1	—	—	—	2	—	—
Chicken Pox	29	18	10	6	6	12	9	14	—
Conjunctivitis Inf.	—	7	—	—	—	—	—	—	—
Diphtheria	3	4	4	4	11	8	2	13	2
Encephalitis Epid.	—	—	—	1	—	1	—	3	2
German Measles	1	1	—	2	2	1	2	1	1
Influenza	1	—	—	—	1	2	2	1	3
Malaria (Therapeutic)	—	2	—	1	—	—	—	—	—
Measles	34	26	14	17	14	28	34	23	6
Mumps	5	6	6	9	4	5	28	11	8
Paratyphoid Fever	—	—	—	—	—	—	2	1	1
Pneumonia (Broncho)	6	9	4	4	7	8	5	12	2
Pneumonia (Lobar)	21	5	6	7	9	5	7	3	6
Poliomyelitis	—	—	—	2	9	37	97	67	115
Rabies in Humans	—	1	—	—	—	—	—	—	—
Scarlet Fever	19	9	11	17	7	7	7	12	10
Septic Sore Throat	1	—	—	2	4	—	3	2	1
Trachoma	—	—	1	—	—	—	—	—	—
Tuberculosis (Pul.)	31	29	15	28	23	23	13	21	17
Tuberculosis (O. F.)	3	2	2	3	2	1	—	1	1
Typhoid Fever	1	2	4	3	5	4	2	6	—
Undulant Fever	1	1	2	—	—	—	—	—	—
Whooping Cough	119	66	64	79	41	84	69	70	61
Gonorrhea	50	25	15	34	24	22	56	37	37
Syphilis	35	32	21	22	27	33	32	36	40

Remarks: No cases of Asiatic cholera, glanders, plague, or yellow fever during the past seven years.

TUBERCULOSIS ABSTRACTS

BY THE NATIONAL TUBERCULOSIS ASSOCIATION

TUBERCULOSIS AND THE HEALTH EXAMINATION

In spite of much popular education the majority of cases of tuberculosis are not discovered until the disease is already well advanced. Williams and Hill, who studied the experiences of 1,499 patients in tuberculosis sanatoria, found that 12% on admission to the sanatorium were classified as minimal tuberculosis, 43% were moderately advanced, and 45% were far advanced.

The family doctor is on the firing line. The early symptoms of tuberculosis are usually indefinite and the patient first of all consults the doctor "around the corner". We cannot, however, always charge the delay in making a diagnosis to the doctor. More frequently the patient is himself responsible for the delay or the disease itself may be so insidious as to cause no alarming symptoms until the advanced stage has been reached. Williams and Hill found that of the 1,499 patients interviewed, 33% sought medical advice within one month after the first symptom appeared; 29% allowed a period of one to five months to elapse before going to the doctor; 9% waited from six to eleven months; 24% delayed from one to twenty years.

DELAY IN DIAGNOSIS

Tuberculosis organizations have repeatedly given forceful publicity to the early symptoms of tuberculosis including the urgent advice "to let your doctor decide". Such publicity almost invariably calls forth from certain laymen the criticism that the doctor is incapable of deciding. While such comments are doubtless unfair, they do raise the ques-

tion as to how promptly the diagnosis is made by the physician, once the patient has come to him.

Williams and Hill found that the physicians took less time to decide that their patients had tuberculosis than the patients required to become aroused to their need of medical advice. At least 43% of the group were diagnosed within a month of the first visit and almost one-half of these were told they had tuberculosis at the first consultation. This record is distinctly commendable. The less favorable side of the picture is that 16% of the patients had to wait a year or more before they were told they had tuberculosis.

A more severe test of the ability to make diagnoses early may be made by analyzing only the group diagnosed as "minimal," of which there were 181 (out of the total of 1,499). Of this minimal group 70 came to the doctor within one month of the appearance of the first symptom. Twenty-six (37%) of them were diagnosed within the first month and 15 (21%) waited a year or more before a diagnosis was made.

What is the hope of discovering early tuberculosis among patients who come complaining of no particular symptom but simply for a health examination? The danger signs are frequently overlooked, perhaps because doctors are not always "tuberculosis conscious". The early signs of tuberculosis (with the exception of hemoptysis and pleurisy) seldom direct attention forcibly to pathological changes in the lungs. The symptoms are usually vague and indefinite. Lawrason Brown has said it might be well for every doctor to hang a sign in his office reading "Remember Syphilis and Tuberculosis" for these are the two great simulators of other diseases. . . .

FINDING TUBERCULOSIS IN YOUTH

To be "tuberculosis conscious" is particularly necessary when examining youngsters in their late teens and early twenties. The dramatic rise of the tuberculosis death rate in the age period 15 to 25 contrasted with the low rate during early childhood, suggests that adolescence is for many the transition period; indeed the critical period for many who develop tuberculosis.

Most cases of adult type tuberculosis represent a super-infection on previously infected soil. In the adolescent period the sleeping embers of tuberculosis seem to burst into flame within a relatively short time. Then it is that we should be unusually alert for any danger signs of developing tuberculosis. Nor should it be forgotten that certain types of tuberculosis progress rapidly, as for example the subapical type in which the disease seems to develop acutely in the lung region immediately below the clavicle. From that focus it may spread or gradually become chronic and the suspicion of some is that the apical type, generally considered to represent very early pathological involvement, is but the remains of a subapical, acute process. Other forms of acute development are the miliary and bronchopneumonic types.

HISTORY AND PHYSICAL SIGNS

Pulmonary tuberculosis may exist without any suggestion of ill health. While the history at best can be only suggestive, a careful history-taking is important. Underweight is no measure of the presence of tuberculosis, although rapid loss of weight is very suggestive. Of great significance is any suspicion that the patient has been in contact with a case of tuberculosis in the family, particularly if exposure has taken place during childhood. . . .

In all instances in which the chest examination reveals abnormal signs, a radiograph should be made. In patients with suggestive symptoms and negative physical signs, a radiograph should also be made, for some early lesions can be discovered only in this way. . . .

Later observations have shown that infection is by no means so widespread. A positive reaction in an adult is of scant significance, but a negative reaction speaks volumes; it almost certainly excludes tuberculosis.

A GROUP DISEASE

Tuberculosis should be regarded as a group disease. Hence when a case of tuberculosis has been discovered the entire family should be examined, not only at that time of discovery of the active case, but also periodically thereafter. The examination of the children should include the tuberculin test and, if the reaction is positive, a radiograph. In examining contacts, one should not omit the older persons of the household. . . .—*The Health Examiner*, April 1932.

INCREASE IN MALNUTRITION

In a recent *Weekly Bulletin* of the New York City Department of Health, a short article on "The Effect of Economic Stress on Health," states that an increase in the prevalence of malnutrition following the economic stress prevailing since 1929, is revealed through the physical examinations of school children by physicians of the Department of Health. With between three and four hundred thousand children examined each year, the proportion classed as suffering from malnutrition was approximately 13.5 per cent during 1927, 1928, and 1929, followed by an abrupt rise to 16.1 per cent in 1930, 17.1 in 1931, and to the still higher figure of 20.5 during the first quarter of 1932.

Although, it is pointed out, the term malnutrition is not exact and its interpretation varies widely because of no satisfactory standard, the fact that the examinations during the six years were made by practically the same staff of physicians provides justification for the comparison of the figures. It is further pointed out that if this malnutrition index is at all valid, the need of a considerable intensification of our efforts in order to prevent serious injury to the health of the young generation, is indicated. — *Bulletin of the National Tuberculosis Association.*

BULLETIN RECORD OF MEDICAL VIOLATORS

In the July issue of the *Federation Bulletin*, Dr. H. M. Platter, secretary of the Ohio State Medical Board, reported thirty-nine successful prosecutions for violation of the state medical practice act during the year, May, 1931, to May, 1932. The character of illegal practice is given and the names of the violators are published. In the same issue appears an abstract of the report of the New York grievance committee in which three thousand complaints of illegal practice and two hundred and one complaints against licensed physicians were investigated during the five-year period beginning January, 1927.

The Bulletin editor invites the executive officers of other state boards to follow this custom, and thus make *The Bulletin* the principal medium for collecting this valuable information. If each state board will coöperate, the value of these data will be increasingly evident, particularly when properly classified and indexed. It is proposed to make this a special department and in time to develop it into one of the most important functions of the *Federation Bulletin.—Federation Bulletin*, August, 1932.

CORRESPONDENCE

THE MISMANAGEMENT OF GONORRHEA AND SYPHILIS

The Commonwealth of Massachusetts
Department of Public Health
State House, Boston

August 31, 1932.

Managing Editor,

The *New England Journal of Medicine.*

In a spirit of fairness to those private practitioners of medicine to whom we have directed more or less severe criticism of their handling of certain cases of gonorrhea and syphilis, through the columns of the *New England Journal of Medicine*, we wish here to report two instances of the mismanagement of gonorrhea and syphilis in public clinics aided by this State.

Case No. 1 is that of a young male who two years ago developed a primary lesion of syphilis, for the treatment of which he went immediately to a clinic in this State. He received two courses of treatment consisting of intravenous arsenical and intramuscular bismuth or mercury. Following these two courses his blood tests were negative, and after four or five additional intravenous injections of arsenical he was discharged as probably cured, with the admonition that he should return later for further blood tests. This he failed to do. Something over a year later he married, shortly after which his wife developed secondary syphilis, complicated by a syphilitic iritis which brought her with her husband to medical attention. The husband was found to have active syphilis.

Syphilographers everywhere have by word of mouth, through the literature and by example insisted that no patient with early syphilis should be discharged from treatment upon the first evidence that blood tests are negative. How long after the blood has first become negative treatment should be continued is a matter of discussion, but certainly the consensus of opinion is that, for the sake of safety, the treatment should be continued regularly for at least one year. In some clinics regular treatment is continued for fifteen to eighteen months following the reversal of blood serology. It is difficult frequently to make patients understand this.

It is disappointing that a physician in charge of one of our public clinics should have failed to appreciate the importance of this continued treatment. The various blood tests for syphilis depend upon the existence of a sufficient quantity of substances produced by the blood in the presence of the spirochete. It is apparent that this production of these substances is relatively slow and that a considerable accumulation of them must be present in the blood before the tests will become positive. Evidence to this effect is that the blood will remain negative sometimes for as long as two or three weeks following the appearance of the primary lesion. It is conceivable that after a certain amount of treatment, resulting in the death of the great majority of the spirochetes, the concentration of these substances in the blood may again have dropped below that which is measurable by blood tests, without the disease having been eradicated. It has been through years of experience with relapses and recurrences, following the too early discontinuance of treatment, that it has been necessary to establish more or less empirically that treatment should be continued a year or more following the reversal of the blood serology.

The second case is that of a girl infected with gonorrhea by a married man in another State. The source of her infection was under the care of a physician who provided douche material, through the patient, for the young woman. Shortly thereafter she came back to Massachusetts and a second physician in the Metropolitan area confirmed the diagnosis of gonorrhea and gave treatment. A relative eventually complained of her condition and her neglect of treatment, with the result that, through the efforts of the social worker in this Department, she was referred, with the permission of the physician who had been treating her, to a Boston clinic. She was dismissed from that clinic as not infected, because the gonococcus could not be found in two successive smears. This in spite of the fact that the clinic did make a diagnosis of "leucorrhea" and her past history was readily obtainable.

In view of all that has been written by this Department and in which the Department has been supported by a number of physicians of authority concerning the unreliability of negative smears, it is exceedingly discouraging to have had this girl, for whom so much time had been spent in securing

her return to treatment, dismissed on such a flimsy bit of evidence (?). It also emphasizes the importance of the patient's past history as a part of the medical study of the case.

Yours truly,

N. A. NELSON, M.D., *Assistant Director*,
Division of Communicable Diseases.

TITUS-PEARLS AND THE TEUTONIA IMPORT AND EXPORT SERVICE

American Medical Association
535 North Dearborn Street, Chicago,
August 31, 1932.

Managing Editor,
The *New England Journal of Medicine.*

In re: "Titus-Pearls"

We have seen the advertising of "Titus-Pearls" that are said to have been "created" by Dr. Magnus Hirschfeld, "world-known authority on Sexology and Director of the Institute for Sexual Science of Berlin, Germany". About a year ago we received an inquiry about Dr. Hirschfeld, and on looking him up in foreign directories, we found that he was recorded as having an honorary title, "Sanitätsrat", and as having been chairman of Kartell for Reform of Sexual Jurisprudence. This is all that we were able to learn about him.

We might add that we never heard of the Teutonia Import and Export Service Company of New York until it began to advertise Titus-Pearls. From the advertising claims, it seems rather obvious that this product is just another one of the numerous "rejuvenation treatments" that are foisted on a credulous public. Doubtless you know the Post Office Department has already got around to some of the "gland cures" and debarred them from the mail as fraudulent and is looking into others.

Very truly yours,

AMERICAN MEDICAL ASSOCIATION,
Bureau of Investigation.

ARTICLES ACCEPTED BY THE AMERICAN MEDICAL ASSOCIATION COUNCIL ON PHARMACY AND CHEMISTRY

535 North Dearborn Street, Chicago, Ill.
August 26, 1932.

In addition to the articles enumerated in our letter of July 30 the following have been accepted:

Abbott Laboratories
- Haliver Oil with Viosterol 250 D—Abbott
  - Soluble Gelatin Capsules Haliver Oil with Viosterol 250 D—Abbott, 3 minims

Ciba Co., Inc.
- Solution Dial—Ciba with Urethane, Sterile Ampules, 1.1 cc.
- Solution Dial—Ciba with Urethane, Sterile Ampules, 2.3 cc.

Cutter Laboratory
- Normal Serum (From the Horse), 100 cc. bottle

Lederle Laboratories, Inc.
- Normal Horse Serum, 30 cc. vial packages

National Drug Co.
- Tetanus Perfringens Antitoxin

Parke, Davis & Co.
- Liver Extract—P. D. & Co.
  - Vials Liver Extract—Parke, Davis & Co.
- Liver Extract, Intramuscular—P. D. & Co.
  - Glaseptic Ampoules Solution Liver Extract—P. D. & Co. (Intramuscular)
- Parke-Davis Haliver Oil with Viosterol—250 D
  - Soluble Gelatin Capsules Parke-Davis Haliver Oil with Viosterol—250 D, 3 minims

Smith, Kline & French Laboratories
- Pentnucleotide
  - Vials Pentnucleotide, 10 cc.

The following articles have been exempted and included with the List of Articles and Brands Accepted by the Council But Not Described in N. N. R. (New and Nonofficial Remedies, 1932, p. 487):

Sharp & Dohme, Inc.
- Pollen Extracts Diagnostic—Mulford, zone test packages

Yours truly,

W. A. PUCKNER, *Secretary*,
Council on Pharmacy and Chemistry.

RECENT DEATHS

GRAINGER—WILLIAM HENRY GRAINGER, M.D., died at Winthrop, Massachusetts, September 1, 1932, aged 88. He was regarded as the dean of physicians in Winthrop and East Boston. Dr. Grainger came to this country from Ireland, where he was born, after the Civil War and graduated from the New York University Medical College in 1870. He practiced in Winthrop until two years ago. He joined the Massachusetts Medical Society in 1882, retiring in 1916.

Dr. Grainger leaves a widow, a daughter Miss Jessie Grainger and four sons; Dr. Edward J. Grainger of Winthrop, Henry and George Grainger of East Boston and John Grainger of Bath, Maine.

PIERCE—FRANK BENEVILLE PIERCE, A.B., M.D., died in Haverhill, Massachusetts, September 1, 1932. He was born in Haverhill August 28, 1858, the son of Darius and Emma Orinda (Hilton) Pierce. He graduated from Dartmouth in 1882 and from the New York University Medical College in 1886. He joined the Massachusetts Medical Society in 1887. After devoting himself to teaching, occupying the position of principal of the Amherst, New Hampshire, high school and later with a school in Charleston, South Carolina, he returned to Haverhill in 1889 and carried on practice there through the rest of his life. He has occupied the position of President of the Essex North District Medical Society and supervising censor of the Massachusetts Medical Society and was a Fellow of the American Medical Association. He was prominent in the civic and social affairs of Haverhill, having held membership in Merrimac Lodge A. F. and A. M., Haverhill Commandery K. T.,

and the Mizpah Lodge of Odd Fellows. Dr. Pierce is survived by his widow, who was before her marriage Katie Ingalls Sleeper, a son James Beck Pierce, a daughter Hortense Katherine Sargent, wife of Edmund B. Sargent, and a sister Mrs. Nellie Gabeler.

SMITH — MURDOCH CAMPBELL SMITH, M.D., also with degrees in dentistry, died at his home, 36 Rogers Avenue, Lynn, Massachusetts, August 29, 1932. He was born in Cornwallis, Nova Scotia, in 1856.

Dr. Smith was a graduate of Howard University School of Medicine but devoted himself largely to dental surgery for the past forty years. He joined the Massachusetts Medical Society in 1889 and retired in 1927. Dr. Smith was a former president of the Massachusetts Dental Society and a life member of the Harvard Dental Alumni Association. He was a member of the Intercolonial Club of Boston, the Olivette Commandery, Knights Templars, and Aleppo Temple, order of the Mystic Shrine.

Dr. Smith is survived by his widow.

ALLISON — NATHANIEL ALLISON, A.B., M.D., died August 30, 1932, in La Jolla, California. He was born in 1876 and graduated from the Harvard University Medical School in 1901 and joined the Massachusetts Medical Society in 1902. Afterward he engaged in practice in St. Louis and was connected with the Washington University School of Medicine for several years. He returned to Boston and renewed his membership in the Massachusetts Medical Society in 1924. He was appointed First Assistant Professor of Surgery in the Harvard Medical School in 1923 and Professor of Orthopedic Surgery in 1924 holding that position until 1929 with a service at the Massachusetts General Hospital. After completing his service at this hospital, he moved to Chicago to fill the position of Professor of Surgery in the Graduate School of Medicine of the Biological Sciences of the University of Chicago.

He is survived by his widow Mrs. Marion Allison and a sister, Mrs. Joseph W. Lewis of St. Louis.

This brief account will be followed by a fitting obituary.

NOTICES

ASSIGNMENT OF PASSED ASSISTANT SURGEON APPLEWHITE

Notice has been issued by the U. S. P. H. Service that Passed Assistant Surgeon C. C. Applewhite has been relieved of duty at Jackson, Mississippi, and assigned to duty at Boston, Massachusetts, to engage in field studies of public health.

Dr. Applewhite has been promoted and commissioned a Surgeon in the Regular Corps of the U. S. P. H. Service to rank as such from October 1, 1932.

A COURSE FOR PHYSICIANS ARRANGED BY THE NEW YORK PSYCHOANALYTIC INSTITUTE

The New York Psychoanalytic Institute announces an introductory course for physicians, Psychoanalysis in Medicine, consisting of ten lectures.

These lectures will begin on Thursday, October 6, at 8:20 P.M., at the Institute and will continue for ten successive Thursdays.

This course has been approved by the Committee on Medical Education of the New York Academy of Medicine.

Send for particulars to Dr. M. A. Meyer, Executive Director, at 324 West Eighty-Sixth Street, New York City.

ANNOUNCEMENT

Charles N. Gettes, M.D., announces that his name is incorrectly spelled in the present issue of the Boston Telephone Directory. He is listed as Charles N. Geddes. The correct name and address should be Charles N. Gettes, physician, 471 Commonwealth Avenue, Boston, Kenmore 9220.

CHANGE OF DUTY AND STATION OF COMMISSIONED OFFICER OF THE UNITED STATES PUBLIC HEALTH SERVICE IN NEW ENGLAND

Sanitary Engineer L. M. Fisher. Directed to proceed from New York, N. Y., to New Bedford, Woods Hole, and Vineyard Haven, Mass., and return, in connection with shellfish sanitation.

OFFICE REMOVALS

M. J. Konikow, M.D., wishes to announce the removal of his office and residence to 440 Warren Street, opposite Memorial High School, Roxbury, Massachusetts. Telephone Highlands 7605.

Samuel H. Epstein, M.D., who was formerly at 484 Commonwealth Avenue, Boston, has removed his offices to the Lister Building, 475 Commonwealth Avenue, Boston.

SOCIETY MEETINGS
CONGRESSES AND CONFERENCES

September 10 and 11—New Hampshire Surgical Club. See notice on page 434, issue of September 1.

September 19-22 — International Congress of Biliary Lithiasis. See notice on page 427, issue of February 25.

September 26, 27, 28—Eighth Clinical Congress of the Connecticut State Medical Society. See page 331, issue of August 18.

September 30, October 1—Scientific Program for Annual Meeting of the New England Surgical Society. See page 333, issue of August 18.

October 12, 13 and 14—American Academy of Physical Therapy. See notice on page 384, issue of August 25.

October 17-21—Clinical Congress of the American College of Surgeons. See page 1330, issue of June 23.

October 17-28—The 1932 Graduate Fortnight of the New York Academy of Medicine. See page 1375, issue of June 30.

October 22-24—Health Education Institute. See notice on page 47, issue of July 7.

October 24-27 — American Public Health Association. See notice on page 1321, issue of December 31, 1931.

October 24-28—Inter-state Postgraduate Medical Association of North America. See page 39, issue of January 7.

MIDDLESEX EAST DISTRICT MEDICAL SOCIETY

The program of the Middlesex East District Medical Society for the coming year is as follows:

September 28 at Bear Hill, luncheon at 1:00 P.M.
November 9 at Winchester.
January 11 at Wakefield.
March 15 at Melrose.
May, at the Meadowbrook Club, Reading.

ALLAN R. CUNNINGHAM, Secretary.

BOOK REVIEWS

Nutrition Service in the Field. Child Health Centers: A Survey. A Publication of the White House Conference. The Century Co., New York and London.

This volume of the White House Conference report presents the findings of two subcommittees—that on Nutrition and that on Health Action.

The first section defines the nutritionist and the problem of nutrition work. Generally speaking, the services of the nutritionist consist of promotion and general educational work in the community; instruction, supervision and consultation; direct service to parents, children and institutions; and research. The need for nutrition education is stressed. The voluminous appendix gives examples of nutrition service by national, state and community health and welfare agencies, hospitals, dispensaries and dental infirmaries, schools, commercial organizations and training centers.

The second section consists in a survey of child health centers in this country, and their activities, with recommendations for improving and extending this work.

The Cytology and Cellular Pathology of the Nervous System. Edited by WILDER PENFIELD. Paul B. Hoeber, Inc. New York, 1932. 3 volumes. Pp. 1267. Price $30.00.

These three volumes present a brilliant contribution to our knowledge of neurology and neuropathology. Twenty-seven contributors insure that the field, wide as it is, is adequately and accurately covered. In keeping with the general excellence of the contributions is the work of the publisher. Legibly and attractively printed, with an abundance of clear, well-chosen photomicrographs, drawings and diagrams, the use of excellent paper, and the division into volumes of convenient size do much to add to the pleasure and profit of the readers.

This group of monographs is divided into two sections, the first comprising Volumes I and II, covering the cytology, normal and pathological, of the nervous system, and the second, Volume III, considering neoplasms, malformation and hematogenous reactions of the nervous system.

The work is divided into thirty sections, ranging from the general characteristics of the neuron to the cells in the cerebrospinal fluid. Not even the neural proliferations in the appendix are omitted but are beautifully and clearly presented by Professor Pierre Masson, the unquestioned master of this subject.

These volumes are of such value that no neuropathologist, or indeed no pathological laboratory, should be without them. The reviewer has yet to see a clearer and more thorough discussion of the pineal gland than that presented by Del Rio-Hortega. It is difficult, however, to single out any one section above the others.

Another section of particular interest is that by Penfield on the neuroglia, normal and pathological.

The bibliographies appended to the individual sections are of great value.

There is no systematic consideration of the diseases of the nervous system as such, but rather the work deals with the fundamental structures and the variations of these structures from normal, which are essential to a clear understanding of all disease processes. There can be little doubt that the hope of the editor will be realized, "It is our hope that these volumes may provide the building material and the stimulus for the more complete pathology of the future, and that rapid development of this new pathology may some day necessitate an enlarged and elaborated edition of the second volume."

Quantitative Clinical Chemistry. Volume II. Methods. By JOHN P. PETERS and DONALD D. VAN SLYKE. Baltimore: The Williams and Wilkins Co., 1932. Price $10.00.

This volume is the companion to the previously published one by the same authors in which the clinical application and interpretation of the various chemical determinations were discussed. In the present volume the actual methods used are exhaustively treated.

Chapters I and II contain careful and specific directions for the use of accurate application and preparation of standard solutions. Methods for the drawing and preserving of blood, and for the collection and preservation of other biological material are carefully discussed. This is a most unusual and valuable addition to the average textbook. The remaining chapters are devoted to a discussion of the various methods for analyzing body fluids. A large amount of space is devoted to manometric methods, such as may be advantageously used in large laboratories, but are not necessarily used by practicing physicians. The more common and simple methods for non-protein nitrogen, blood sugar, etc., are also minutely discussed. Each method is critically examined and such modifications as are of importance are included. Alternate methods are also discussed. In the appendix such procedures as the phthalein test and the determination of the icterus index are included. The general index is complete and an excellent and very complete bibliography accompanies each chapter.

The book should be in every laboratory and in the hands of those physicians and technicians who are occupied with clinical laboratory methods.